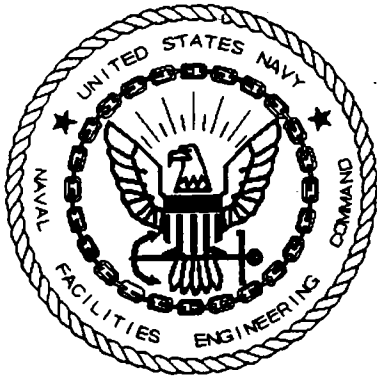


N61165.AR.003067
CNC CHARLESTON
5090.3a

FINAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION
WORK PLAN ZONE J CNC CHARLESTON SC
9/10/1996
ENSAFE/ ALLEN AND HOSHALL

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY
NAVAL BASE CHARLESTON
CHARLESTON, SOUTH CAROLINA
CTO-029**



**FINAL
ZONE J RFI WORK PLAN**

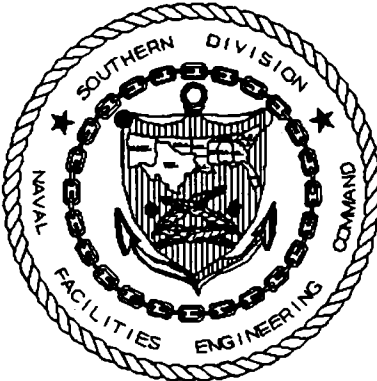
Prepared for:

**DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA**

**SOUTHDIV CONTRACT NUMBER:
N62467-89-D-0318**

Prepared by:

**ENSAFE/ALLEN & HOSHALL
5720 SUMMER TREES DRIVE, SUITE 8
MEMPHIS, TENNESSEE 38134
(901) 383-9115**



September 10, 1996

Release of this document requires the prior notification of the Commanding Officer of the Southern Division, Charleston, South Carolina.

Table of Contents

ACRONYM LIST	v
1.0 INTRODUCTION	1-1
1.1 Environmental Setting	1-2
1.2 Investigative Rationale	1-7
1.3 Human Health Assessment	1-12
1.4 Other Relevant Investigations	1-12
2.0 RISK ASSESSMENT OF NAVBASE WATER BODIES	2-1
2.1 Source Characterization in Water Bodies	2-1
2.2 Preliminary Remedial Action Alternatives	2-6
2.3 Contaminant Fate and Transport	2-7
2.3.1 Source Definition	2-7
2.3.2 Sediment Characteristics Affecting Transport	2-7
2.3.3 Water Transport Characteristics	2-9
2.3.4 Onshore to Offshore Transport Characteristics	2-11
3.0 ACEC-SPECIFIC INVESTIGATIVE APPROACH	3-1
3.1 Phase I — Preliminary Site Assessment	3-2
3.2 Phase II — Contaminant Assessment	3-8
3.3 Phase III — Problem Formulation/Conceptual Model	3-11
4.0 EVALUATION OF NAVBASE HABITATS	4-1
4.1 Overview of Ecological Components	4-1
4.2 NAVBASE ESA and AEC Habitat Descriptions	4-8
4.2.1 ESA I — Warehouse/DRMO Area	4-9
4.2.2 ESA II — Golf Course/Noisette Creek/Officer Housing	4-17
4.2.3 ESA III — Northern Industrialized Area	4-23
4.2.4 ESA IV — Southern Industrialized Area	4-36
4.2.5 ESA V — Southern Open Areas	4-40
4.2.6 ESA VI — Cooper River and Associated Wetlands	4-55
4.2.7 ESA VII — Shipyard Creek and Associated Wetlands	4-69
4.2.8 ESA VIII — Clouter Island AOCs	4-79
5.0 HEALTH AND SAFETY PLAN	5-1
5.1 Introduction	5-1
5.1.1 Applicability	5-1
5.1.2 Work Zones	5-2
5.1.3 Work Area Access	5-2
5.1.4 Zone Research	5-3
5.2 Employee Protection	5-3
5.2.1 Work Limitations	5-4
5.2.2 Zone J Physical Hazards	5-4

5.2.2.1	Underground Utilities	5-4
5.2.2.2	Procedures for Hot or Cold Weather Conditions	5-5
5.2.2.3	Severe Weather Conditions	5-5
5.2.2.4	Working Around Drill Rigs and Heavy Equipment	5-6
5.2.2.5	Waterborne Operations	5-6
5.2.2.6	Standard Safe Work Practices:	5-7
5.2.2.7	General Rules of Conduct:	5-8
5.2.2.8	Medical Monitoring Program	5-10
5.2.3	Chemical Hazards	5-10
5.2.4	Selection of Personal Protective Equipment	5-11
5.2.5	Air Monitoring	5-12
5.3	Decontamination	5-19
5.3.1	Personnel and Equipment Decontamination	5-19
5.3.2	Full Decontamination Procedures	5-20
5.3.3	Partial Decontamination Procedures	5-25
5.3.4	Closure of the Decontamination Station	5-27
5.4	Authorized Personnel	5-27
5.5	Site-Specific Information	5-28
5.5.1	ESA I — Warehouse/DRMO Area	5-28
5.5.2	ESA II — Golf Course/Noisette Creek/Officer Housing	5-29
5.5.3	ESA III — Northern Industrialized Area	5-30
5.5.4	ESA IV — Southern Industrialized Area	5-31
5.5.5	ESA V — Southern Open Areas	5-32
5.5.6	ESA VI — Cooper River and Associated Wetlands	5-32
5.5.7	ESA VII — Shipyard Creek and Associated Wetlands	5-33
5.5.8	ESA VIII — Clouter Island AOCs	5-34
5.6	Emergency Information	5-35
5.6.1	Site Resources	5-36
5.6.2	Emergency Procedures	5-36
5.7	Forms	5-38
6.0	SIGNATORY REQUIREMENT	6-1
7.0	REFERENCE LIST	7-1

List of Figures

Figure 1-1	Ecological Study Area Location Map	1-3
Figure 1-2	Areas of Ecological Concern (Sheets 1 and 2)	1-5
Figure 1-3	Fill Activity Map	1-9
Figure 2-1	Conceptual Site Model	2-3
Figure 3-1	Environmental Risk Assessment Flowchart	3-3
Figure 4-1	DRMO Wetland (AEC I-1)	4-11
Figure 4-2	Lead Contamination in the DRMO Area	4-15

Figure 4-3	Noisette Creek (AEC II-1)	4-19
Figure 4-4	Avenue F Wetland (AEC III-1)	4-25
Figure 4-5	Detention Ponds (AEC III-2)	4-27
Figure 4-6	Chicora Marsh (AEC III-3)	4-29
Figure 4-7	Building 224 Wetland (AEC IV-1)	4-37
Figure 4-8	Headwaters of Shipyard Creek (AEC V-1)	4-43
Figure 4-9	West Road Wetland/Woodland (AEC V-2)	4-45
Figure 4-10	Dredged Materials Area and Surroundings (AEC V-3)	4-47
Figure 4-11	Cooper River Grid Samples	4-61
Figure 4-12	Shipyard Creek	4-71
Figure 4-13	AOCs at Clouter Island	4-81
Figure 5-1	Full Decontamination Layout, Level B Protection	5-21

List of Tables

Table 2-1	Preliminary Remedial Action Alternatives	2-7
Table 4-1	Federally and State-Listed Threatened, Endangered, and Candidate Species That Occur or Potentially Occur on the Charleston Naval Base	4-5
Table 4-2	Maximum Concentrations Detected in Sediments in ESA V\Zone	4-49
Table 4-3	Cooper River USACOE Pre-dredge Sediment Sampling Draft Results, 1995	4-58
Table 4-4	Sediment and Tissue Concentrations from Station CR01 Two-Year Study — 1987 and 1988	4-65
Table 4-5	Trace Metals in Shipyard Creek Sediments 1995 Tidal Creek Project	4-75
Table 5-1	Zone J Chemical Hazards Exposure Information	5-13
Table 5-2	Level of Protection and Criteria	5-15

List of Appendices

Appendix A	Ecological Study Area Checklists for Ecological Study Areas
Appendix B	Ecological Study Area Checklists for Areas of Ecological Concern
Appendix C	Directions to Emergency Medical Facilities
Appendix D	Health and Safety Plan Forms
Appendix E	Material Safety Data Sheets

This page intentionally left blank.

ACRONYM LIST

ACGIH	American Conference of Governmental Industrial Hygienists
AL	Action Level
AOC	Areas of Concern
AEC	Area of Ecological Concern
ANOVA	Analysis of Variance
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Aboveground Storage Tank
bgs	Below Ground Surface
BOD	Biochemical Oxygen Demand
BRA	Baseline Risk Assessment
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CAMP	Corrective Action Management Plan
CEC	Cation Exchange Capacity
CFR	Code of Federal Regulations
CHASP	Comprehensive Health and Safety Plan
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMS	Corrective Measures Study
CNSY	Charleston Naval Shipyard
COD	Chemical Oxygen Demand
COPCs	Chemicals/Contaminants of Potential Concern
CRZ	Contaminant Reduction Zone
CSI	Confirmatory Sampling Investigation
CWP	Comprehensive Work Plan
DANC	Decontaminating Agent Non-Corrosive
DMA	Dredge Materials Area
DNAPLs	Dense Nonaqueous Phase Liquids
DOD	Department of Defense
DQO	Data Quality Objective
DRMO	Defense Reutilization and Marketing Office
E/A&H	EnSafe/Allen & Hoshall
EBS	Environmental Baseline Survey
EIS	Environmental Impact Statement
EM	Electromagnetic
ERA	Environmental Risk Assessment
ESA	Ecological Study Area
EZ	Exclusion Zone
FEIS	Final Environmental Impact Statement
FISC	Fleet Industrial Supply Center
GPS	Global Positioning System
HAZWOPER	Hazardous Waste Operators and Emergency Response
LEL	Lower Explosive Limit
LNAPLs	Light Nonaqueous Phase Liquids
MSDS	Material Safety Data Sheets
MWR	Morale, Welfare, and Recreation Department
NAVBASE	Naval Base Charleston

NE	Northeast
NFI	No Further Investigation
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Agency
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PPE	Personal Protective Equipment
PRC	Preliminary Risk Characterization
PRGs	Preliminary Remedial Goals
PSA	Preliminary Site Assessment
PWC	Public Works Center
QA/QC	Quality Assurance/Quality Control
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SAA	Satellite Accumulation Area
SCBA	Self-Contained Breathing Apparatus
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SOUTHDIV	Southern Division
STEL	Short-Term Exposure Limit
SWMU	Solid Waste Management Unit
SZ	Support Zone
TBC	To Be Considered
TBD	To Be Determined
TICs	Tentatively Identified Compounds
TLV	Threshold Limit Value
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
USACOE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Services
UST	Underground Storage Tank
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WQC	Water Quality Criteria (USEPA)
ZJHASP	Zone J Health and Safety Plan

1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long-term Environmental Action Navy program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan has been prepared to address potential impacts from base activities to the water bodies and wetlands on and surrounding Naval Base Charleston (NAVBASE) in Charleston, South Carolina. Human health risks associated with Zone J contaminants shown to originate from NAVBASE will also be assessed. The scope of this work plan also includes the complete assessment of ecological risk posed by terrestrial sites determined to be potentially hazardous through other zone-specific investigations. This work plan is intended to be used in conjunction with the *Comprehensive RFI Work Plan* prepared for NAVBASE.

To develop this Zone J work plan, it was necessary to first identify all undisturbed or undeveloped areas at NAVBASE which may require further assessment. These areas were identified through a review of pertinent documents and a basewide ecological field survey conducted by EnSafe/Allen & Hoshall (E/A&H) from October 1994 to February 1995. Because of the size of the area to be surveyed, Zone J was divided into eight ecological study areas (ESAs). NAVBASE proper was separated into five contiguous ESAs, each categorized based on similar land type and usage; the remaining three ESAs were assigned to the water bodies and noncontiguous property (Clouter Island; see Figure 1-1).

Ecological Study Areas

ESA I	—	Defense Reutilization and Marketing Office (DRMO)/Warehouse Area
ESA II	—	Noisette Creek/Golf Course/Officer Housing
ESA III	—	Northern Industrial Area
ESA IV	—	Southern Industrial Area
ESA V	—	Southern End of Base
ESA VI	—	Cooper River
ESA VII	—	Shipyard Creek
ESA VIII	—	Clouter Island Areas of Concern

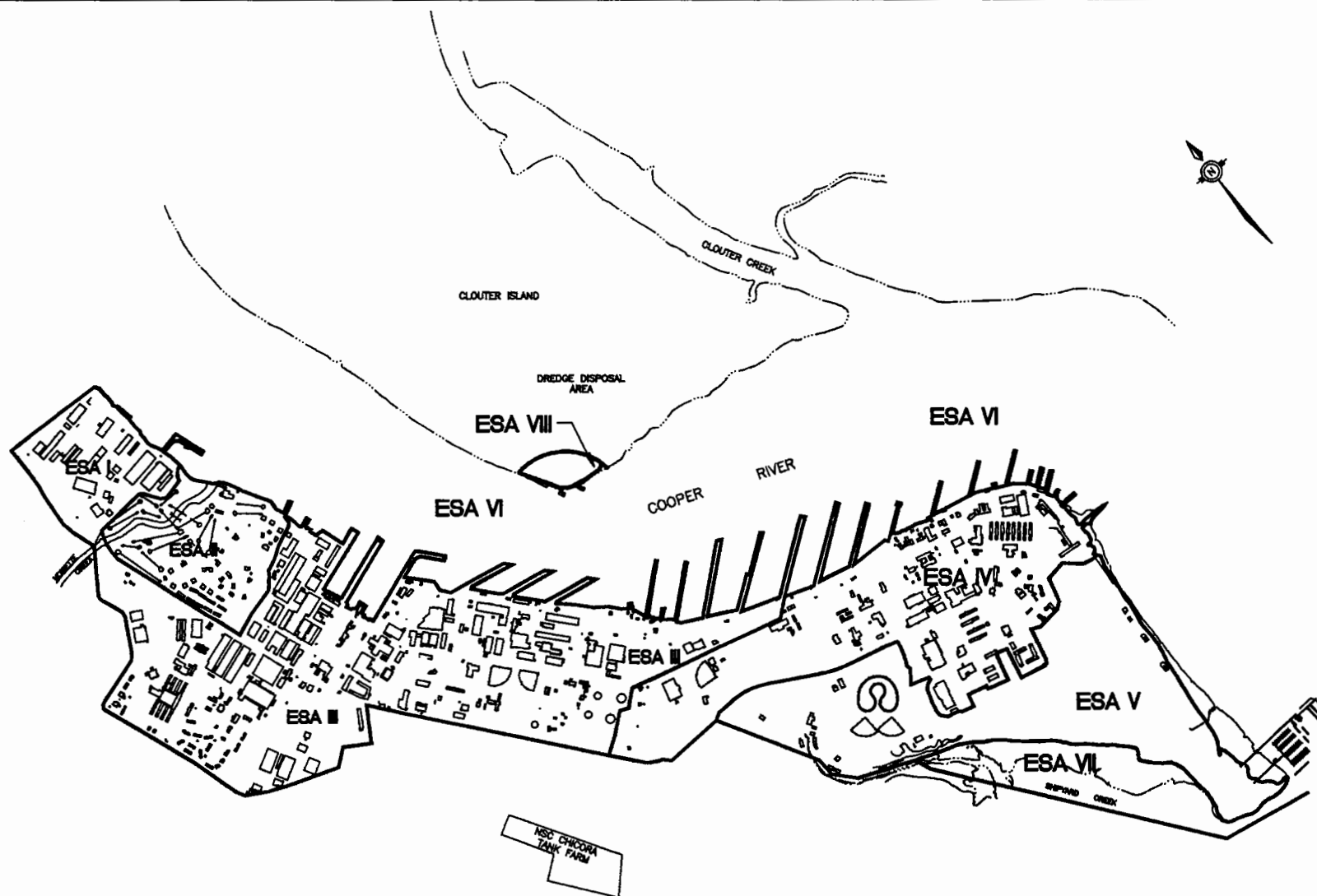
The basewide ecological survey was also intended to provide data which partially satisfied the habitat evaluation objectives of subsequent Phase I Preliminary Site Assessments (PSA) as described in the *Final Comprehensive Baseline Risk Assessment Work Plan* (E/A&H 1994). A complete PSA was also performed at specific areas within each ESA determined to be of ecological significance. Ecological data obtained from the survey and Phase I PSA have been incorporated into the proposed investigative strategies presented in Section 3 and were used for the selection of tentative sampling locations proposed in each zone-specific investigation. The specific areas of ecological concern (AECs) observed during each ESA survey are highlighted in Figure 1-2 (Sheets 1 and 2). The boundary of each RFI investigative zone (Zones A through K) is represented by a bold, dashed line.

1.1 Environmental Setting

Physiography

NAVBASE is in the lower South Carolina Coastal Plain Physiographic Province, on the Cooper River side of the Charleston Peninsula formed by the confluence of the Cooper and Ashley rivers. Topography in the area is typical of the South Carolina lower coastal plain, having low-relief plains broken only by the meandering courses of sluggish streams and rivers which flow toward the coast past occasional marine terrace escarpments.

The water bodies included in the Zone J RFI are a portion of the Cooper River (ESA VI), which forms the eastern border of NAVBASE; Noisette Creek, a small tributary to the Cooper River in the northern portion of the base (ESA II); and Shipyard Creek (ESA VII), a drainage creek southwest of NAVBASE. Also included are the woodlands and wetland habitats surrounding the Zone K areas of concern on the southwest shoreline of Clouter Island (ESA VIII).



LEGEND

— ESA BOUNDARY

2500 0 2500
SCALE FEET

SOURCES: SOUTHON, n.d. ESE, 1981.



ZONE J
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 1-1
ECOLOGICAL STUDY AREA
LOCATION MAP

DWG DATE: 08/05/96 | DWG NAME: 29ESALM1

1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long-term Environmental Action Navy program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan has been prepared to address potential impacts from base activities to the water bodies and wetlands on and surrounding Naval Base Charleston (NAVBASE) in Charleston, South Carolina. Human health risks associated with Zone J contaminants shown to originate from NAVBASE will also be assessed. The scope of this work plan also includes the complete assessment of ecological risk posed by terrestrial sites determined to be potentially hazardous through other zone-specific investigations. This work plan is intended to be used in conjunction with the *Comprehensive RFI Work Plan* prepared for NAVBASE.

To develop this Zone J work plan, it was necessary to first identify all undisturbed or undeveloped areas at NAVBASE which may require further assessment. These areas were identified through a review of pertinent documents and a basewide ecological field survey conducted by EnSafe/Allen & Hoshall (E/A&H) from October 1994 to February 1995. Because of the size of the area to be surveyed, Zone J was divided into eight ecological study areas (ESAs). NAVBASE proper was separated into five contiguous ESAs, each categorized based on similar land type and usage; the remaining three ESAs were assigned to the water bodies and noncontiguous property (Clouter Island; see Figure 1-1).

Ecological Study Areas

ESA I	—	Defense Reutilization and Marketing Office (DRMO)/Warehouse Area
ESA II	—	Noisette Creek/Golf Course/Officer Housing
ESA III	—	Northern Industrial Area
ESA IV	—	Southern Industrial Area
ESA V	—	Southern End of Base
ESA VI	—	Cooper River
ESA VII	—	Shipyard Creek
ESA VIII	—	Clouter Island Areas of Concern

The basewide ecological survey was also intended to provide data which partially satisfied the habitat evaluation objectives of subsequent Phase I Preliminary Site Assessments (PSA) as described in the *Final Comprehensive Baseline Risk Assessment Work Plan* (E/A&H 1994). A complete PSA was also performed at specific areas within each ESA determined to be of ecological significance. Ecological data obtained from the survey and Phase I PSA have been incorporated into the proposed investigative strategies presented in Section 3 and were used for the selection of tentative sampling locations proposed in each zone-specific investigation. The specific areas of ecological concern (AECs) observed during each ESA survey are highlighted in Figure 1-2 (Sheets 1 and 2). The boundary of each RFI investigative zone (Zones A through K) is represented by a bold, dashed line.

1.1 Environmental Setting

Physiography

NAVBASE is in the lower South Carolina Coastal Plain Physiographic Province, on the Cooper River side of the Charleston Peninsula formed by the confluence of the Cooper and Ashley rivers. Topography in the area is typical of the South Carolina lower coastal plain, having low-relief plains broken only by the meandering courses of sluggish streams and rivers which flow toward the coast past occasional marine terrace escarpments.

The water bodies included in the Zone J RFI are a portion of the Cooper River (ESA VI), which forms the eastern border of NAVBASE; Noisette Creek, a small tributary to the Cooper River in the northern portion of the base (ESA II); and Shipyard Creek (ESA VII), a drainage creek southwest of NAVBASE. Also included are the woodlands and wetland habitats surrounding the Zone K areas of concern on the southwest shoreline of Clouter Island (ESA VIII).

Geologic and Hydrogeologic Information

The local and regional geologic/hydrogeologic characteristics are described in Volume II, Sections 1.2 through 1.5 of the *Comprehensive RFI Work Plan*. The geology of the Charleston area is typical of the southern Atlantic Coastal Plain. Of particular relevance is the anthropogenic origin of soil throughout the base. NAVBASE, like most of the Charleston peninsula bordering the Ashley, Cooper, and Wando rivers, was originally low-lying marsh. By 1901, when the Navy took over the property, most of the northern half of the present property had been filled. The southern end of the base has since been filled with a wide variety of materials, with the majority of the filling activity taking place during World War II. Most of these filled areas have since been developed for other uses. Figure 1-3 indicates the extent of modern fill activities.

Shallow groundwater beneath NAVBASE flows north-northeast into the Cooper River and south-southeast into Shipyard Creek due to the gently sloping topography away from the center of NAVBASE. The water table is within 3 to 7 feet of the ground surface. The shallow groundwater table slowly but continually discharges to the Cooper River and Shipyard Creek and, to a lesser extent, to Noisette Creek.

Climatology

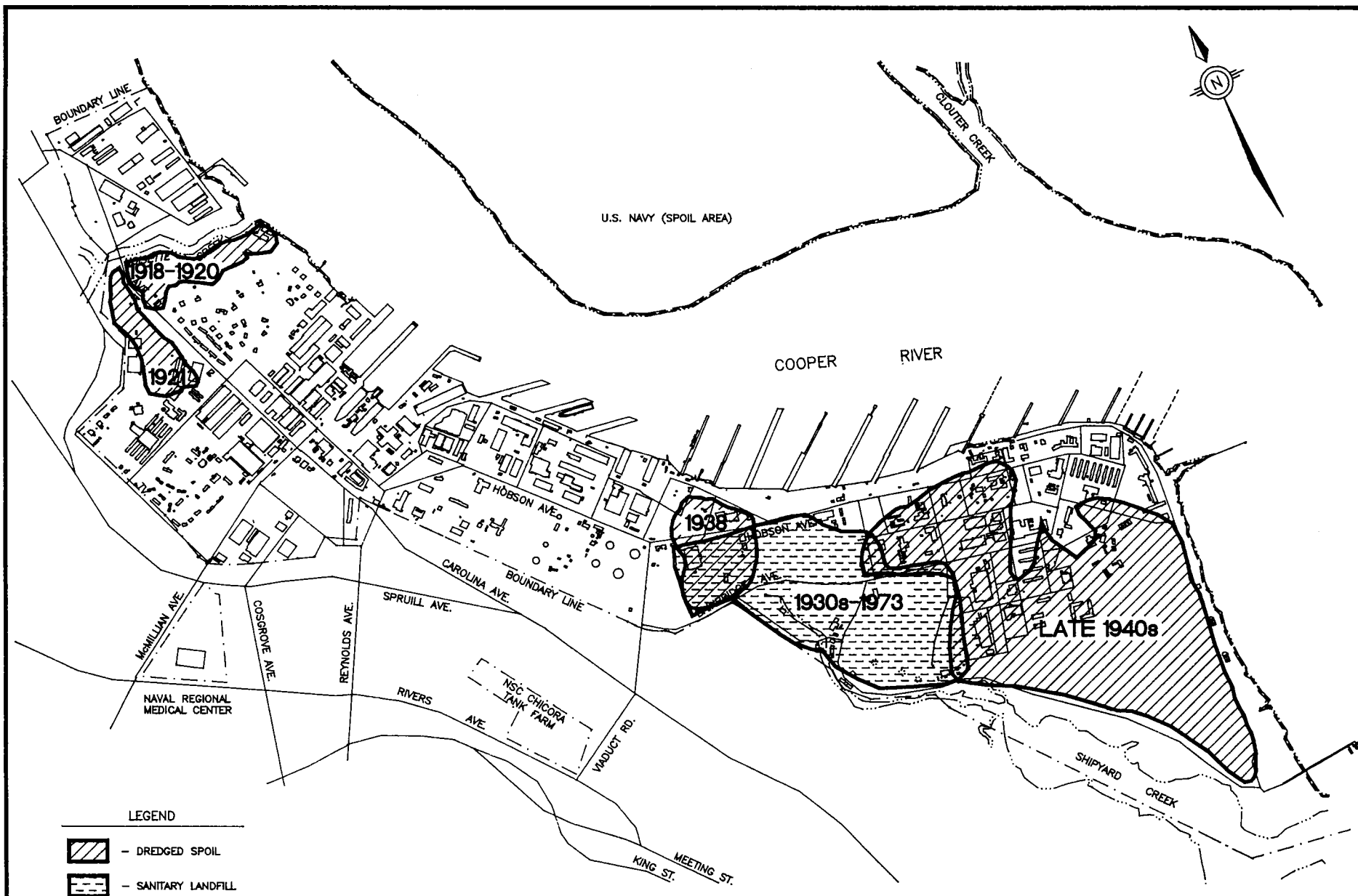
The climate of NAVBASE is described in Volume II, Section 1.6 of the *Comprehensive RFI Work Plan*.

1.2 Investigative Rationale

The investigative rationale for the Zone J RFI has been developed to meet several RFI objectives. The foremost objectives are to assess the impact of past and present NAVBASE activities upon the surrounding water bodies and to ultimately identify constituents of potential concern (COPCs). Other objectives are to define the nature and extent of any contamination and to collect data in support of a corrective measures study (CMS). To meet these objectives,

sampling methods and locations discussed in this work plan are designed to be as complete as possible. If the initially proposed sampling efforts do not achieve this goal, the investigation will continue until sufficient data are obtained to achieve the stated goals. To determine whether additional sampling not specified in this work plan is needed, data collected under this plan will be evaluated regarding potential human health and ecological impacts expressed as preliminary remedial goals (PRGs) and technical requirements for a CMS. For some chemicals, additional information regarding background concentrations will be required, necessitating onsite and offsite data collection. Background, migration pathways, human and ecological receptors, and PRGs are discussed in Section 1, Volume III of the *Final Comprehensive RFI Work Plan*. Sampling will continue until the extent of any contamination associated or potentially associated with past and present NAVBASE Area of Concern/Solid Waste Management Unit (AOC/SWMU) operations is determined, which is defined herein as the horizontal and vertical area in which concentrations of COPCs in the investigated media are above either PRGs or background concentrations, whichever is appropriate. Background concentrations for inorganics will be determined using the "2X rule." Using this rule, background will be regarded as concentrations less than or equal to the mean concentration of the designated background sampling locations multiplied by two. While this simple rule is considered adequate for screening purposes, anticipated complexities will require a more refined calculation of background concentrations for remedial decision-making.

The Zone J RFI will also ensure that each zone-specific AOC/SWMU investigation includes a complete and formal ecological risk assessment (ERA) following the strategies presented in Section 3, Volume III of the *Comprehensive RFI Work Plan*. Preliminary assessments of specific AECs may be conducted as part of a zone-specific investigation and, if necessary, completed during the Zone J RFI. The overall investigative strategy for NAVBASE Charleston is presented in Volume I of the *Comprehensive RFI Work Plan*, which emphasizes the "fast-track cleanup" program.



SOURCES: SOUTHDIV, n.d. ESE, 1981.

2000 0 2000
SCALE FEET



ZONE J
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 1-3
AREAS FILLED AND
APPROXIMATE DATES
OF FILLING OPERATIONS

DWG DATE: 11/04/94 DWG NAME: 29FILCHJ

Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

The Zone J RFI will implement a phased approach to data collection that will ultimately be used to determine if cause-effect relationships exist between contaminant concentrations at AOCs/SWMUs and the observed impacts to potential receptors. It is important to note that, without SWMUs, readily discernible AOCs, or true RCRA facilities within Zone J, the progress of the Zone J investigation of both inland and open water AECs will largely depend on the availability of AOC/SWMU-specific contaminant information obtained during related zone investigations. The collaborative approach proposed for the Zone J investigation is outlined in Section 2.

This *Zone J RFI Work Plan* outlines the data collection process for the RFI of the water bodies as well as the preliminary assessments of AOC/SWMUs in each particular zone where associated contaminants may impact an AEC. The few AOCs specific to Zone J are offshore in the Cooper River — AOCs 500, 501, and 502 (underwater unexploded ordnance [UXO] sites) and AOCs 691 and 692 (the Cooper River waterfront itself). Not meeting the RCRA definition of a “facility” and lacking conditions typically found at terrestrial sites, the water bodies will be assessed through the evaluation of the potential receptor(s) and/or transport pathways rather than the potential contaminant source(s). The *Comprehensive RFI Work Plan* discusses how source data will be obtained during other zone RFIs and used to fulfill the AOC/SWMU-specific goals of the land-based portions of the RFI. As the Comprehensive RFI requires, an RFI/Baseline Risk Assessment (BRA) report will be generated at the conclusion of each zone investigation. Final RFI and Final BRA reports will address NAVBASE as a single entity once all zone investigations are completed.

The proposed schedule for conducting the Zone J investigation is included in the *Corrective Action Management Plan* prepared for the NAVBASE RFI. Due to its comprehensive nature and need to incorporate all relevant information into the RFI report, the Zone J RFI must parallel other zone investigations. To support the fast-track objectives, the submittal of each zone-specific RFI report will not be suspended until the basewide risk assessment is completed.

Instead, each RFI report will present, at a minimum, a summary of preliminary risk assessment findings. Scheduling of activities during the Zone J investigation will be closely coordinated with U.S. Environmental Protection Agency (USEPA) Region IV, the South Carolina Department of Health and Environmental Control (SCDHEC), and natural resource trustees.

1.3 Human Health Assessment

Each upland zone is responsible for addressing human health issues specific to AOCs and SWMUs within that zone. Likewise, Zone J RFI will address human health issues, which are primarily related to the open water bodies (i.e., exposure to affected surface water, sediment, and biota). Risks to human health associated with these media, summarized in Section 2.1 of this plan, will be assessed as outlined in Section 2 of the *Comprehensive Baseline Risk Assessment* (E/A&H 1994).

1.4 Other Relevant Investigations

Because the Zone J RFI is part of a larger investigative strategy, results from other investigations may influence the scope of the proposed work for Zone J. In addition, some pathways included for investigation in Volume III of the *Comprehensive RFI Work Plan* and relevant to Zone J will be considered in other zone investigations. Storm sewer lines, which are potentially significant contaminant pathways to and from various Zone J areas, will be addressed in greater detail in the *Zone L RFI Work Plan*. The investigations of nearshore zones (A, B, C, E, H, and I) are expected to provide particularly valuable information regarding potential sources and related impacts to the Zone J water bodies. Each zone-specific AOC/SWMU investigation will assess nearby drainage ditches suspected of conveying contaminants from the site to potential receptors (including Zone J AECs). Dredge spoil materials will also be characterized as part of several zone investigations to establish a baseline data set representative of dredge materials across all historic dredge disposal areas at NAVBASE (Figure 1-3). Offsite investigation to determine reference areas will be conducted as part of both the Comprehensive and Zone J RFI. Finally, results from other zone-specific RFIs will also be necessary to fully understand the significance of the results of the proposed Zone J investigation.

2.0 RISK ASSESSMENT OF NAVBASE WATER BODIES

The Zone J RFI will assess risk to both human health and the environment from exposure to contaminants associated with the water bodies surrounding NAVBASE Charleston (including Cooper River, Shipyard Creek, and Noisette Creek) which are known or suspected to be associated with AOCs/SWMUs. Risks associated with specific land-based AOC/SWMUs will be preliminarily addressed in their respective Zone RFIs. The proposed approach for conducting the ERAs at NAVBASE is further detailed in Section 3. The following discussion represents the basis for the Zone J approach to determining the relationships between NAVBASE AOCs/SWMUs and the potential receptors within the Zone J water bodies.

2.1 Source Characterization in Water Bodies

Water bodies adjacent to NAVBASE have the potential (past and current) to be affected by numerous industrial and commercial contaminant sources. Although some sources are likely to be associated with NAVBASE activities, there are many other potential contributors. The focus of the sampling investigations in adjacent water bodies will be the characterization of known or suspected impacts related to releases from NAVBASE AOCs/SWMUs. To further that concept, significant upstream (or background) surface water and sediment sampling may be conducted in an attempt to differentiate between impacts associated with NAVBASE operations and those originating from other sources. In situations where no obvious link can be made between observable impacts and NAVBASE contaminants, no specific assessment can or will be performed. Furthermore, if there is no visible or reasonably expected presence of human or ecological receptors, affected or otherwise, it is deemed unnecessary to conduct a formal risk assessment.

Conceptual Site Model

The following discusses possible contaminant exposure scenarios for both human and ecological receptors in the Zone J water bodies. For ecological risk determination, organisms residing in the water bodies are defined as the primary receptors, while secondary receptors are defined as

those transient organisms potentially affected by contaminants as they migrate through the ecosystem and food chain. Figure 2-1 presents the initial components involved with this model.

The primary transport phenomena expected to warrant analysis are the following:

- Direct discharge through pipes or other man-made conveyances emanating from an AOC/SWMU
- Fuel pipeline/underground storage tank (UST) and industrial waste sewer system leaks
- Leachates from fill materials
- Miscellaneous contaminant spills

Secondary sources may include the actual affected media (groundwater, soil, and sediment) which may potentially impact the water bodies through infiltration, percolation, or overland storm water runoff (secondary release mechanisms). These transport processes will be evaluated through analysis of physicochemical data obtained from relevant land-based RFIs as well as the engineering properties of the AOC/SWMU from which contamination is believed to emanate. Zone-specific sampling strategies calling for sample locations radiating from the suspected source will assist in determining whether contaminants have spread beyond the immediate site and have the potential to impact Zone J receptors. These sampling strategies are discussed in detail in the individual zone-specific work plans.

Upon introduction of contaminants into the surface water system (through direct discharge at aquatic AOCs or indirect from land-based AOC/SWMUs), they may dissolve into the water column, adsorb onto suspended particulate matter in the water column, or accumulate in the benthic zone. The release mechanism is simply the exposure of receptors to these media. Currents, tides, and flushing actions of the water bodies also act as release mechanisms, transporting both the dissolved and adsorbed contaminants through the water and sediment.

A possible secondary source would be the bioaccumulation of contaminants within aquatic biota, which would then provide a mechanism for secondary release through biota migration. Exposed biota continue and often accelerate the transportation process through the food chain.

Human Exposure Routes

There are a number of potential human exposure pathways from these aquatic sources. Due to the brackish nature of surface water bodies surrounding NAVBASE, potable use will not be considered as a viable means of exposure. The following paragraphs describe exposure pathways expected to be the primary routes for human exposure to Zone J contaminants.

Surface Water/Sediment — Incidental ingestion and dermal contact may occur during recreational activities and/or infrequent work-related activities. Zone J water bodies may support limited recreational use. Current and future site workers (i.e., maintenance staff and workers at nearshore facilities) may have occasional contact with impacted surface water and sediments. As a result, recreationist and site worker exposure potential will be considered when developing the risk assessment for Zone J. In most instances, sediment exposures will be limited to nearshore areas where sediments are exposed during low tide and/or low flow conditions. Impacted sediments which are constantly submerged or inaccessible from shoreline will not be considered when estimating potential direct exposure to humans.

Airborne Contaminants — Volatilized contaminants may be inhaled during recreational and/or infrequent work-related activities. If areas of gross volatiles contamination are identified in Zone J surface waters (or adjacent land-based AOCs/SWMUs that could impact surface water), inhalation exposure assessment may be warranted. Volatilization modeling may be necessary to predict the ambient air concentrations of contaminants associated with these impacted areas. If modeling outputs suggest potential air pathway-related concerns, ambient air sampling may be necessary to confirm or refute the results.

Fish/Shellfish — Ingesting contaminated specimens may also provide an exposure pathway. Surface water and sediment impacts can manifest themselves in the form of contaminated biota. Fish and shellfish inhabiting Cooper River, Shipyard Creek, Noisette Creek, and other Zone J waters may become contaminated through contact with surface water or sediment. Humans ingesting these specimen may in turn be exposed to contaminants concentrated in edible tissues. The potential for such exposures will be preliminarily evaluated based on methods reliant upon bioaccumulation potential.

Because numerous potential contaminant sources other than NAVBASE exist, direct analysis of tissue samples is not considered the most appropriate initial means of evaluating site-specific biota impacts. Tissue concentrations will be estimated based on surface water and sediment concentrations, chemical characteristics, and reasonable migration patterns of representative species. These concentrations will be compared to USEPA Region III risk-based screening values in a manner analogous to that applied to environmental media. If screening value exceedances are noted, more rigorous assessment may be required. Data from local studies regarding fish/shellfish harvesting and consumption, the prevalence of subsistence fishing in the NAVBASE vicinity, and other demographic information will be referenced to provide reasonable assumptions for projecting chronic exposure potential and related risk/hazard.

2.2 Preliminary Remedial Action Alternatives

Given the initial conceptual model and regulatory guidance values and "To Be Considered" (TBC) criteria for the water bodies, preliminary objectives and approaches for remediation have been identified in Table 2-1. Appropriate remedial alternatives for the water bodies will be developed further as the Zone J RFI proceeds and the zone-specific sites are more fully characterized. Any of the general response actions or remedial technology types listed in Table 2-1 can be used to achieve remedial action alternatives for either human health or ecological concerns.

**Table 2-1
Preliminary Remedial Action Alternatives**

Medium	Remedial Action Objectives	General Response Actions	Remedial Technology Types
Surface Water/ Sediment	For Human Health: Prevent human exposure to surface water/sediment containing site contaminants possibly resulting in a 10^{-6} excess cancer risk level, or in excess of reference doses.	No Action/ Institutional Actions: No action, access restriction.	Fencing, deed restrictions.
	For Environmental Protection: Prevent migration of contaminants resulting in surface water concentrations in excess of ambient water quality criteria; protect biota affected by contaminants in sediment.	Containment Actions: Containment. Excavation/Treatment Actions: Excavation, surface collection; treatment; disposal, on or offsite.	Capping, sediment control barriers, surface water controls. Dredging/excavation; dewatering, fixation, solidification, stabilization, immobilization; chemical, physical, biological, thermal (ex- or in-situ) treatment; landfilling, or discharge.

2.3 Contaminant Fate and Transport

2.3.1 Source Definition

Activities associated with identified SWMUs and AOCs at NAVBASE Charleston have likely contributed to significant input to the water bodies and bottom substrate identified within Zone J. These facilities were primarily involved in paint stripping and metal plating operations. The primary contaminants expected from these operations are metals such as chromium, cadmium, lead, copper, and cyanide, and solvent constituents such as trichloroethylene (TCE) and ketone compounds. Petroleum hydrocarbon-based products associated with past ship maintenance and refueling services at the piers may also have impacted the surrounding water bodies.

2.3.2 Sediment Characteristics Affecting Transport

Contaminant movement and availability in marine sediments can be difficult to assess. Variables such as organic carbon, grain size, and sulfides are critical to sediment loading capacities. In addition, specific contaminant characteristics such as molecular weight or sediment/water partitioning coefficients can affect adsorption or chemical degradation rates or potentials. For organic constituents, molecular size parameters, such as molecular weight, molecular volume, and area may control persistence in sediments.

Metals

For metals, adsorption potentials for sediments are related to grain size, pH, cation exchange capacity (CEC), and, to a lesser extent, organic carbon. Fine-grained particles, particularly aluminosilicate clays, provide a greater surface area and a crystalline microstructure conducive to the adsorption of inorganic contaminants. These fine-grained sediments are much more susceptible to current movements and may hold relatively higher metal concentrations when compared to coarser-grained sediments.

Mobilization of metals in sediments is a function of the overlying water's pH, temperature, and the oxidation-reduction potential (redox). Higher pH surface waters favor precipitation from solution and result in increased sediment concentrations. Lower pH favors dissolution and results in release of metals from sediments. Given equal pH values, salinity effects on metals will favor precipitation of metals from water, with consequent accumulation of these metals in sediments.

Within the Cooper River, Shipyard Creek, and Noiset Creek, the primary transport mechanism for metals bound to sediment will be through physical movement of the sediment itself. Metals can be tightly bound within the mineral structure and thus currents will be the predominant transport mechanism. Over time, contaminated sediment will most likely be transported from its initial depositional location, making distribution and effects difficult to determine.

The fate of metals in sediments include both chemical and biological transformations. Chemical transformation may involve formation of organo-metallics, complexation with sulfides or methylation occurring from microbial processes. Transfer of metals through biological uptake by benthic infauna is also a possibility, but biomagnification of metals is not considered a critical pathway.

Organics

Organic contaminants, particularly hydrophobic compounds, tend to sorb to water-borne particulates (clays, colloids, humic substances) that eventually end up as bottom deposits. From here, they may be transformed into more or less toxic forms, or they may migrate from the sediment into benthic organisms via respiration or they may reach overlying waters as physicochemical conditions change.

Sediment organic carbon in the form of humic substances (measured by total organic carbon, [TOC]) is the primary storage compartment for neutral organic chemicals in sediments. Also, particle size and chemical hydrophobicity (i.e., highly insoluble in water; will adhere to less energetic phase) are important environmental influences affecting sorption rates. Increased surface area resulting from decreased particle size provides more adsorption sites for neutral organic chemicals by means of van der Waals/London forces.

For polynuclear aromatic hydrocarbons (PAHs) in sediments, photolytic degradation rates are a function of the available penetrating radiation (sunlight) and oxygen. In low light/low oxygen environments and/or when PAH compounds are tightly bound to organic substances, they may persist indefinitely but are still not particularly bioavailable.

Fate of organic constituents in sediments is influenced by biotransformation and biodegradation by benthic organisms. Neutral organics that are more hydrophobic tend to be more bioavailable and persistent in the food chain due to their accessibility when they bind with organic substances.

2.3.3 Water Transport Characteristics

In water, the likelihood that a dissolved contaminant will be retained within the medium is dependent on that chemical's fugacity, or escaping tendency, and partitioning coefficient. The fugacity potential is based on both the chemical-specific traits and medium thermodynamic

influences. The partitioning coefficient is an indication of a chemical's affinity for water or another medium (sediment, tissue, suspended particles). Under ideal conditions, the partitioning coefficient for a chemical is constant, but the environmental parameters that can influence partitioning vary with site conditions.

Environmental variables include but are not limited to suspended and dissolved material, light attenuation, pH, and Eh (redox). While pH and Eh have strong influence on metals, these parameters have little effect on neutral organic chemicals. Generally, higher pH environments have more particulate matter and metals can precipitate out. In seawater, the presence of divalent cations of magnesium (Mg^{+2}) and calcium (Ca^{+2}) can cause suspended fine-grained sediments, colloids, and dissolved organic matter to flocculate, or form a loose mass, and settle from the water column. Organic contaminants may coprecipitate with metal complexes on the these flocculated materials. Dissolved organic carbon (DOC) in water, composed primarily of humic substances produced by the degradation of dead plant material, can also provide binding sites for metal ions and neutral organics.

Biological fate of a contaminant is related to its octanol-water partitioning coefficient (K_{ow}). This is the tendency of a chemical to be attracted to organic versus nonorganic environments. With chemicals having a K_{ow} below 5, biomagnification is not significant, but in the range of 5 to 7, it is significant. As in sediment, biological effects may include degradation or transformation into another chemical form. Although chemical concentrations of contaminants in water may be reduced compared to sediment concentrations, availability is increased.

Other less intrinsic factors that may affect biological availability of organic chemicals include organism lipid content, species physiology, steric hindrance, and physicochemical parameters.

2.3.4 Onshore to Offshore Transport Characteristics

Shoreline segments are included in this investigation to determine potential contaminant transport pathways from groundwater to water-based sites. The three potential pathways observed were from point-source discharge, groundwater flow, and surface water runoff to Zone J surface water and sediment.

Groundwater Transport

Typical groundwater flow patterns at the interface of fresh groundwater and saline groundwater in coastal areas show that fresh groundwater flows upward, along the surface of the more dense saline groundwater, and discharges at the surface (Fetter 1993). A resultant cyclical flow occurs in the saline groundwater, causing it to also flow upward. Because of this vertical component of flow, fresh groundwater generally discharges into the sea floor at some distance offshore. The width of this outflow face depends on the discharge volume from the aquifer at the shoreline, the density difference of the fresh and saline groundwater, the hydraulic conductivity (K) of the aquifer, and the width of the discharge face along the shoreline, and can be calculated using the following equation:

$$x_o = \frac{-Gq}{2K}$$

where

x_o = width of outfall face

G = density difference of fresh and saline groundwater

= $p_w/(p_s - p_w)$ where

p_w = density of fresh groundwater

p_s = density of saline groundwater

q = discharge of the aquifer

K = hydraulic conductivity

•
Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

3.0 AEC-SPECIFIC INVESTIGATIVE APPROACH

In addition to the complete assessment of the surrounding water bodies (including AECs VI and VII; the Cooper River and Shipyard Creek), the Zone J RFI will also perform any necessary follow-up ERAs of potentially impacted AECs preliminarily identified during other zone investigations. The Zone J investigatory approach is therefore designed to evaluate the overall impact from NAVBASE activities on surrounding terrestrial and aquatic ecosystems and will assess risk to both human and ecological receptors. The Zone J RFI will follow the procedures outlined in the *Final Comprehensive Baseline Risk Assessment Work Plan for Naval Base Charleston* (E/A&H 1994). Due to the wide scope of the Zone J RFI, the investigation has been divided into three phases, each intended to yield specific environmental data about the AECs at NAVBASE through source, pathway, and receptor identification.

Phase I consists of a Preliminary Site Assessment (PSA) of each AEC to determine general site information and, if necessary, to develop a sampling strategy for Phase II of the investigation, which will involve assessing contamination at each AEC through chemical sampling. Problem formulation and model development will occur in Phase III to assess risk to potential receptors. Information from all phases, as appropriate, will be incorporated into a risk calculation to measure or estimate current and future effects. Figure 3-1 charts the framework for the BRA process.

Phase II Contamination Assessment sampling strategies of Zone J AECs will be guided by Phase I PSA data and by the analytical data from relevant AOC/SWMU investigations, whenever possible. Before AEC-specific Phase I investigations can be properly executed, a broad investigative approach (i.e., ESA designations, basewide habitat evaluations) was necessary to identify undeveloped and/or undisturbed portions of NAVBASE.

To obtain basic ecological information for NAVBASE, each ESA was evaluated by reviewing pertinent ecological data such as those presented in the *Final Environmental Impact Statement*

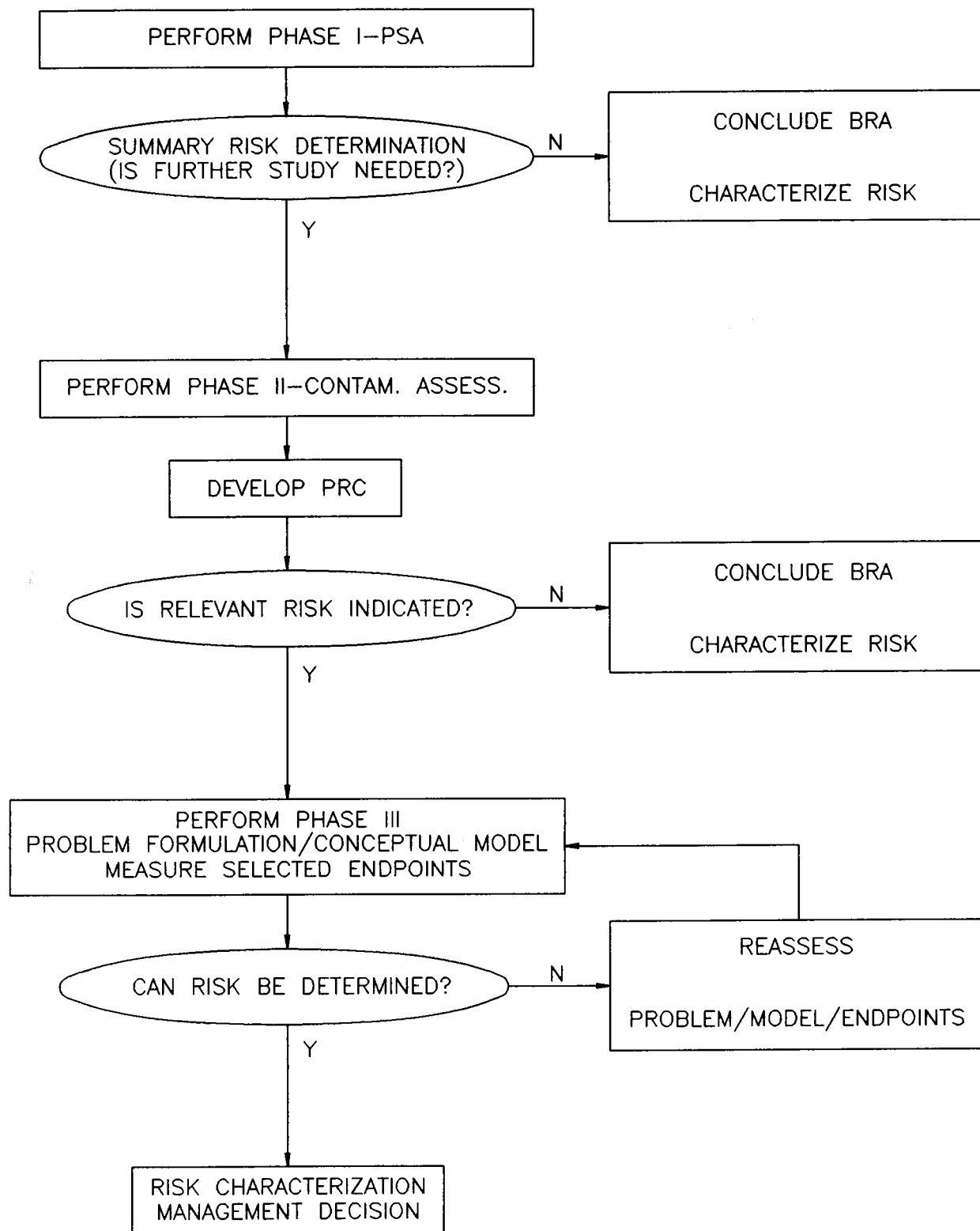
for Disposal and Reuse of the Charleston Naval Base (FEIS; E&E 1995). Ecological checklists for habitat types and potential receptors at NAVBASE were also completed for each terrestrial ESA during the basewide habitat survey and are presented in Appendix A. In addition to the open water bodies, these areas of ecological concern (see Figure 1-2) will be the focus of Phases II and III of the ERA process proposed for the Zone J RFI and will be guided by other relevant zone investigations and AEC-specific details obtained from Phase I, including habitat types, location of outfalls, and potential receptors.

The aquatic ESAs were evaluated through field observations and a review of existing and available information from previous assessments. Except for the Charleston Harbor Study, these studies included data from only a few isolated sampling and monitoring stations within the Cooper River and Shipyard Creek. Results from these studies are summarized in Section 4.

Phase II Contaminant Assessment sampling locations presented in this plan are designed to determine if an identified AEC is potentially impacted by an upgradient AOC/SWMU. If the resulting analytical data are sufficient to reasonably and quantitatively determine an AEC is impacted, the Phase II investigation will be complete. The locations presented in this plan are considered tentative and, if appropriate, may be implemented in the relevant zone-specific investigation.

3.1 Phase I — Preliminary Site Assessment

The PSA of each AEC was completed in April 1995 to provide preliminary descriptions of the undeveloped and undisturbed areas at NAVBASE and allow zone-specific investigations to incorporate this information. Each PSA began with a thorough review of all relevant site data, including information obtained from the ESA surveys and checklists, previous investigations, topographic maps, aerial photographs, and any other information pertinent for baseline assessment of impacts to the biological resources within the area. Data were reviewed as made available from RFIs (particularly Zones C, H, and I) throughout NAVBASE.



ZONE J
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 3-1
BASELINE RISK
ASSESSMENT (BRA)
FLOWCHART

DWG DATE: 08/12/96

DWG NAME: 29BRA1

Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

Specific habitat descriptions for each AEC were determined to supplement the data obtained during the ESA habitat evaluations, along with a cursory evaluation of potential biological receptors typically found in such habitats. A biological inventory was performed at each AEC to obtain information on confirmed and/or suspected biological receptors, including flora and fauna. The PSA noted outfall locations and other potential contaminant migration and exposure routes to the AEC. These and other physical AEC data were used to select tentative, non-site-specific sampling locations. These data were recorded on AEC-specific checklists presented in Appendix B.

Numerous recent basewide studies, interviews, and regional ecological assessments at NAVBASE are compiled in the FEIS (E&E 1995), which summarizes ecological data and includes land use, terrestrial and aquatic environments, threatened and endangered species, wetland areas, floodplains, and environmental aspects such as storage tanks, outfalls, and adjacent properties. To reduce the duplication of effort, the FEIS was a primary reference for the initial ESA site visits.

Habitat Evaluation

After relevant data were reviewed, habitats were evaluated to assess current conditions of each AEC. Ecologists experienced in assessment procedures and familiar with the flora and fauna of the Charleston area visited each AEC. For terrestrial areas and free-standing wetlands, the ecologists evaluated habitat, identified common plant communities and sensitive resources, and assessed the probability of threatened or endangered species within the AEC. This evaluation also involved field determinations for wetland presence, critical and unique habitats, and any other special habitat that might be indicated (see Section 4.1). Data obtained from a prior review of state and federal documents such as National Wetland Inventory Maps, National Forest List, South Carolina State Parks List, and South Carolina Critical Habitats were used to enhance the field effort.

During the PSA for the open-water ESAs (ESAs VI and VII) and all potentially impacted riparian wetlands, the habitat was evaluated primarily through the review of existing habitat data and a site visit via motor boat or canoe. Contamination effects at each AEC were visually assessed. Anomalous features such as stressed or absent vegetation, unusual odors, colors, or stains were also recorded on the appropriate checklist.

Biological Inventory

Information on the suspected biological receptors at NAVBASE reviewed during the basewide habitat evaluation and PSAs is summarized in Section 4.1. These biological data were obtained from regional, state, and federal agency information such as Natural Areas Inventory, Threatened and Endangered Species List, and other applicable studies for NAVBASE. State and federal agency personnel have also been interviewed for current status of suspected biological receptors. From this information and field observations, a list of potential biological receptors at each AEC has been produced.

Because there is no standard method for conducting the PSA, the ecologists used the general biological survey methods outlined in Section 8.3 of *Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference* (USEPA/600/3-89/013). Specific approaches varied based on habitat type, size, and diversity.

Migration Routes

Obvious contaminant migration routes from AOCs/SWMUs to nearby AECs were identified whenever possible to determine if ecological components may be at risk. Pathway identification will also be addressed in the zone-specific RFIs. Topographic features for each contaminated site were reviewed, along with identifying other physical conduits such as channels, drainage ditches, catch basins, and streams. In some instances, groundwater may constitute the primary migration pathway for contaminant exposure to natural resources remote from a site. Much of this information was obtained through review of documents, U.S. Geological Survey (USGS)

topographic maps, site visits, and the hydrogeological portion of the completed RFI zone investigations.

Exposure Routes

Based on information derived from the PSA and migration route determination, exposure route scenarios will be developed whenever possible to indicate potential contamination pathways to suspected biological receptors. These exposure scenarios are working hypotheses that provide a starting point for developing the subsequent problem formulation phase.

Phase I Conclusions

After Phase I PSA data such as the identification of nearby AOC/SWMUs, outfalls, wetlands, and general environmental conditions were compiled and evaluated, a tentative Phase II sampling strategy was developed. Phase I data are presented in Section 4.2 along with a summary risk determination and maps indicating the locations of habitats, plant communities, and previous sampling locations at relevant AOCs/SWMUs.

For AECs which were sufficiently characterized during preliminary screening in previous zone-specific RFI investigations, this risk prediction is a subjective analysis designed as a "go-stop" mechanism for the subsequent Phase II sampling. However, at AECs without adequate screening analytical data, final Phase II recommendations will be based on both the PSA and preliminary risk assessments conducted during the zone-specific RFIs.

Phase I Sampling Strategy

For terrestrial sites such as woodlands and open fields, soil sampling locations will be determined based on observed migration and exposure routes. Sampling locations at aquatic sites will be directed at areas where contaminants are determined most likely to accumulate. These will be based on surface features, drainage patterns, and, if necessary, the distribution of fine-grained sediment and/or organic content. If, at a later point in the investigation, it is

determined that additional areas need to be addressed, based on either groundwater flow or other factors, these areas will also be sampled.

3.2 Phase II — Contaminant Assessment

A Phase II Contaminant Assessment will be required only at AECs which are shown to be impacted or potentially impacted from an AOC or SWMU and where human or ecological receptors exist or are indicated. Phase II sampling locations at the Zone J AECs will be determined from relevant AOC/SWMU investigations and the results of the Phase I investigation. All Phase II soil, sediment, groundwater, and surface water sampling will be conducted in accordance with protocols outlined in the *Comprehensive Sampling and Analysis Plan* for NAVBASE. In soil, surface (0 to 1 foot below ground surface [bgs]) concentrations will be used for risk evaluations. Physical soil parameters (pH, porosity, grain size, organic content, etc.) that may alter contaminant bioavailability will be measured in conjunction with chemical analyses. Sampling densities will be based on location-specific information and data needs. Section 5, Sampling Procedures, presents general sampling concerns for each phase.

Phase II Sampling Procedure

All sampling will adhere to the NAVBASE Charleston *Comprehensive RFI Work Plan*. The nature of the proposed Zone J ecological sampling may, however, require more effective methods than those described in the *Comprehensive Sampling and Analysis Plan* (CSAP) or other zone work plans. Any necessary biota sampling, for example, will require special collection equipment and techniques. Also, three offshore UXO sites will require special procedures, as stated below. The most appropriate procedures, once selected, will be submitted for approval and included as a technical memorandum and/or a modification to the *Comprehensive RFI Work Plan*.

Soil/Sediment Samples — Terrestrial samples and samples in water shallower than wading depth will be collected using a stainless-steel hand auger. Sediment samples from deeper locations will be collected using a Ponar grab sampler or similar device.

Grid Samples — For the open water sites, grid sampling will be conducted. The distances between grid and transect lines will vary depending on the size of the area to be sampled and the degree of precision desired. For grid sampling in larger wetlands, each established grid node will be assigned a coordinate number. If an adequate grid has not been established for sampling a particular area, one will be created.

Proposed Analytical Parameters

All surface water, sediment and soil samples collected in Zone J AECs will be analyzed using the following USEPA, SW-846, Third Edition method parameters:

VOCs	USEPA 8240
SVOCs	USEPA 8270
Pesticides/PCBs	USEPA 8080
Cyanide	USEPA 9010
Metals	USEPA 6010, 7060 (As), 7412 (Pb), 7470 (Hg), 7740 (Se), and 7841 (Tl)

Sediment and soil samples also will be analyzed for Total Organic Carbon (TOC; USEPA 415.1, 415.2) and organotins (laboratory standard operating procedure).

A portion of the samples will be duplicated and analyzed for Appendix IX parameters, such as hexavalent chromium, dioxins, herbicides, organophosphate pesticides, and more comprehensive lists of VOCs and SVOCs. Any deviations from the above listed parameters will be discussed and justified in the appropriate AEC sampling plan.

In aqueous environments, biased surface water and sediment samples will be collected in areas suspected to exhibit significant contaminant concentrations. These areas will be identified using sediment distribution and dredging maps provided by the U.S. Army Corps of Engineers (USACOE) or other data developed during Phase I. Sediment samples will be collected to at least 6 inches below the substrate surface. Suspected and confirmed source locations, along with suspected risk to biological receptors in the area, will be used to determine whether to sample these media. Sampling methods will follow protocols suggested in USEPA's *Sampling Protocols for Collecting Surface Waters, Bed Sediments, Bivalves, and Fish for Priority Pollution Analysis* (Versar, Inc., 1981) and USEPA's *Ecological Assessment of Hazardous Waste Site: A Field and Laboratory Reference Document* (EPA/600/3-89/013). As with soil, physicochemical data on water and sediment will be obtained for use in bioavailability predictions. For water, data will include temperature, salinity, alkalinity, dissolved oxygen, pH, conductivity, nutrients, total suspended solids, biochemical oxygen demand, turbidity, and chemical oxygen demand. For sediments, data will include pH, Eh, TOC, CEC, grain size, and density. Once suitable reference locations are identified, background concentrations will be obtained and supplemented with literature information whenever possible.

After baseline data have been collected on contaminants, the general characteristics of the stressor chemicals will be studied to provide specific data on intensity, chemical alteration, duration, and secondary effects. Any site-specific information on soil and water chemistry obtained from the zone-specific RFIs will also aid in assessing the potential effects of the stressor.

Preliminary Risk Characterization

After completing the contamination assessment at each AEC, a Preliminary Risk Characterization (PRC) will be formulated. This characterization will assimilate data obtained during the Phase I PSA and Phase II Contaminant Assessment to predict effects to critical biological receptors, based on conservative contamination estimates. These predictions-of-effects will be based on

comparison of observed contaminant values to regulatory guidance or TBC values. TBC values include USEPA Ambient Water Quality Criteria, USEPA Region IV Sediment and Surface Water Screening Values, and Risk-Based Concentrations (RBCs) in addition to referenced effects concentrations of the toxicological characteristics for suspected contaminants. To help determine the overall risk to potential human and ecological receptors, the contaminant concentrations determined from other zone-specific AOC/SWMU investigations will also be assessed. If an AOC/SWMU-specific investigation indicates contamination below applicable regulatory screening values, the scope of the subsequent Zone J investigation may be reduced (fewer samples). The effects of physical disruptions (dredging) will also influence the breadth of the investigation. Receptor-specific physiological traits and media transport mechanisms that may alter toxic effects may also be used to formulate effects scenarios. Because effects to receptors may have already occurred at NAVBASE, a more in-depth analysis of historical biological data may be required to verify predictions. For instance, sediment-borne contaminants may have, over time, already altered fishery resources in the Cooper River. If, after careful consideration, such a cause-effect relationship appears to exist, historical biological data (recreational catch statistics, etc.) may aid in verifying this prediction.

After completing the PRC, a decision will be made on the need for further ecological work. Such decisions will be critical in the ERA process and, therefore, the PSA and PRC components are considered extremely important elements.

3.3 Phase III — Problem Formulation/Conceptual Model

The problem formulation stage is the most critical element of the ERA process. In this stage, data collected during the PSA and PRC will be analyzed to determine if assessment endpoints can be identified. Assessment endpoints, which are the environmental components to be protected at each AEC, will be chosen based on the PRC. Ecological endpoints typically include changes to local fish populations, ecosystem alterations, or other ecological effects. Assessment endpoints for human health include excess cancer incidence and other toxic effects possibly

caused by contaminants proven to be associated at NAVBASE. Hypotheses will be critically reviewed to determine if studies or data produced can support risk-management decisions.

In conjunction with problem formulation, a conceptual model will be developed to select measurement endpoints that can be used to quantitatively express the effects of the contaminant hazard. These measurement endpoints will include environmental characteristics directly related to the assessment endpoint chosen. Toxicity tests, community indices, or tissue burden studies may be selected as measurement endpoints (see Appendices C, D, and E of the *Comprehensive Baseline Risk Assessment Work Plan*, [E/A&H 1994] for descriptions of these measurement endpoints). The model will include the methods (sampling plan) needed to collect the information necessary to test the model and address uncertainty issues. At this stage, a decision will again be made on whether assessment endpoints are appropriate and whether the ERA process should continue. Appropriate agency consultation during this problem development and modeling phase will ensure that selected objectives are applicable and relevant.

Site Assessment

After formulating a reasonable conceptual model, a site will be assessed to determine the practicality of testing the hypothesis. Phase II data collected on contaminant distributions and biological receptor availability will be used to propose sampling methods for the conceptual model. The overall feasibility of obtaining necessary model components will be the site assessment's goal. A decision will be made as to the model's applicability based on field observations.

Site Investigation

The site investigation will involve all remaining field sampling, in-situ monitoring, and measurable endpoint data collection. All work will follow the conceptual model design to test the formulated hypothesis.

Risk Characterization

After completing the site investigation, all data will be interpreted to determine the cumulative risk to receptors based on contamination found. Both quantitative and qualitative information derived during the AEC investigation will be used to determine a weight-of-evidence conclusion.

Important issues that will be addressed include the assessment of exposure versus the observed or predicted environmental effects and their type, extent, and severity. Risks and uncertainties will also be summarized and their apparent significance interpreted.

Reference Area Identification

An essential part of the ERA will be identifying probable reference areas. These reference areas will be as geographically close to the site as possible, with similar habitat, topography, geology, and hydrology. Selected reference areas will have no apparent impacts from known site source contamination, based on survey and historical information.

Identifying suitable reference areas near the NAVBASE AECs has historically been a challenge due to the heavily industrialized surroundings. Although this condition has delayed the selection of appropriate Zone J reference areas, it is suspected that suitable reference areas may be found in the wetland and open water habitats of the Ashley or Wando rivers.

Wetland Procedures

If a wetland requires delineation for remedial or other purposes, the boundaries will be determined using methods described in the USACOE 1987 *Wetland Delineation Manual* (also refer to Appendix A of the *Comprehensive Baseline Risk Assessment Work Plan*).

UXO Procedures (AOCs 500, 501, and 502)

Due to the special nature of these sites, an Explosive Ordnance Disposal (EOD) subcontractor will be selected to conduct these investigations. Upon selection, the EOD subcontractor will be

tasked to prepare an addendum to the work plan describing the specific techniques that will be used to locate the ordnance. Sediment and surface water samples will be collected at these sites after the ordnance is located and safely removed or detonated in place. At that time, samples shall be collected relative to the site of the ordnance recovery/detonation and analyzed for constituents associated with the specific type of weapon. If the ordnance cannot be located, confirmation sampling covering a broader, more general area may still be warranted.

4.0 EVALUATION OF NAVBASE HABITATS

4.1 Overview of Ecological Components

The Charleston Naval Base consists of approximately 1,575 acres of moderately to heavily developed coastline with 614 buildings totaling 7,965,505 square feet. Features on the base include: approximately 2.3 million square feet of industrial space; 1.8 million square feet of warehouse space; 2.2 million square feet of administrative space; 86 residences; 19 residential barracks; 152 marina slips; 23 piers; five drydocks; and recreational facilities (FEIS 1995). The majority of NAVBASE is characterized as disturbed material (USGS 1993), consisting primarily of dredged fill material and material used in the upkeep of NAVBASE's gravel, asphalt, and concrete parking areas, buildings, laydown yards, and improved roads.

To reduce duplication of effort, the general ecological information presented in this section was supplemented primarily from the Environmental Impact Statement (Pre-Final) and verified in the field during E/A&H's ESA habitat evaluations whenever possible.

Vegetation — The extensive development and anthropogenic disturbances that have occurred at NAVBASE have greatly influenced the naturally occurring vegetation, most evident in the limited diversity. Some areas, such as the shipyard, contain very little vegetation of any sort. Only the southern portion of NAVBASE is dominated by native vegetation, much of which is associated with Shipyard Creek and the dredge disposal area. The ESA/AEC descriptions further detail vegetation observed in each area.

Terrestrial Wildlife — The various types of habitat present at NAVBASE, including residential, woodland, and adjacent coastal areas, support diverse mammalian, herpetilian, and avian wildlife populations. With the relative isolation of portions of NAVBASE and the abundant coastal habitat, the greatest diversity of wildlife is found in avian fauna.

Because of the relatively isolated nature of NAVBASE (i.e., extensive development to the west and the Cooper River to the east), the mammals onsite are predominantly smaller species. The largest verified mammals include the raccoon (*Procyon lotor*) and opossum (*Didelphis virginiana*), although white-tailed deer (*Odocoileus virginianus*) and the gray fox (*Urocyon cinereoargenteus*) may be present onsite. Gray and fox squirrels (*Sciurus carolinensis* and *S. niger*), eastern cottontail and marsh rabbits (*Silvilagus floridanus* and *S. palustris*), golden mouse (*Ochrotomys nuttalli*), and other small rodent species may also be present.

Various reptiles and amphibians are also expected to occur onsite. Species may include the northern diamondback terrapin (*Malaclemys terrapin terrapin*), green anole (*Anolis carolinensis*), broad-headed skink (*Eumeces laticeps*), eastern garter snake (*Thamnophis sirtalis*), and southern leopard frog (*Rana utricularia*).

Numerous avian species use NAVBASE and surrounding areas, including species commonly occurring in developed areas, in open field and edge communities, and along coastal areas. Extensive coastal habitat near the site is available for use by a multitude of transient avian species in addition to the resident species. Species typical of developed/residential areas include the American robin (*Turdus migratorius*), northern cardinal (*Cardinalis cardinalis*), purple finch (*Carpodacus purpureus*), fish crow (*Corvus ossifragus*), European starling (*Sturnus vulgaris*), and a variety of gulls (*Larus* spp.). Open fields and edge communities will generally support higher concentrations and diversity of species, including Carolina chickadee (*Parus carolinensis*), northern junco (*Junco hyemalis*), eastern kingbird (*Tyrannus tyrannus*), eastern meadowlark (*Sturnella magna*), mockingbird (*Mimus polyglottis*), cedar waxwing (*Bombycilla cedrorum*), and barn swallow (*Hirundo rustica*). Because of minimal woodland habitat, few interior forest avian species are expected to inhabit NAVBASE, except during seasonal migrations. Raptors including the red-tailed hawk (*Buteo jamaicensis*) and the American kestrel (*Falco sparverius*) may also use the area. Coastal tidal cordgrass wetlands are typically used by the clapper rail

(*Rallus longirostris*), boat-tailed grackle (*Quiscalus major*), and the red-winged blackbird (*Agelaius phoeniceus*). Tidal mudflats are used by a multitude of wading birds including the larger egrets, herons, and bitterns (Family *Ardeidae*) and the smaller plovers (*Chardrius* spp.), curlews (*Numenius* spp.), and sandpipers (*Tringa* spp. and *Calidris* spp.). The open water of the Cooper River is used by a variety of gulls and terns (*Sterna* spp.), as well as pelicans (*Pelecanus occidentalis*) and osprey (*Pandion halietus*).

Aquatic Wildlife — As part of the Charleston Harbor Estuary, the Cooper, Ashley, and Wando rivers make up the basis of an ecologically complex system which supports a wide variety of estuarine aquatic fauna with more than 570 macroinvertebrate and finfish species (FEIS 1995). The estuary provides seasonal and year-round habitat for both adult and juveniles of many species of fish, crustaceans, and shellfish, many of which are commercially and recreationally important. The estuary's wetlands, marshes, and tidal creeks are important nursery areas for the recruitment of most of the important fisheries.

The biological diversity within the Cooper River is relatively lower than that of the Ashley or Wando rivers, probably a reflection of the higher concentration of industrial and commercial port facilities on the river. However, the river still supports many important species. Commercial fishery resources in the Cooper River near the shipyard consist of some crabbing for blue crab (*Callinectes sapidus*) and a seasonal elver (young American eels, *Anguilla rostrata*) fishery (FEIS 1995). Recreational fishing near NAVBASE occurs in the Cooper River, as well as the smaller tidal Noisette and Shipyard creeks. Typical finfish include sheephead (*Archosargus probatocephalus*), flounder (*Paralichthys* spp.), mullet (*Mugil* spp.), drum (*Stellifer* spp.), Atlantic croaker (*Micropogon undulatus*), spotted hake (*Urophycis requis*), weakfish (*Cynoscion regalis*), spot (*Leiostomus xanthurus*), blueback herring (*Alosa aestivalis*), white catfish (*Ictalurus catus*), silver perch (*Bairdiella chrysura*), and spotted seatrout (*Cynoscion nebulosus*). In addition, white shrimp (*Penaeus setiferus*) and red drum (*Sciaenops ocellatus*)

are also sought by recreational fishermen. Identified shellfish beds of oysters (*Crassostrea virginica*), and various clams and mussels can be found within each of the two tidal creeks. Of ecological importance near NAVBASE are large numbers of bay anchovy (*Anchoa mitchelli*), Atlantic menhaden (*Brevoortia tyrannus*), and grass shrimp (*Palamonetes* spp.), which are the major forage base for many higher trophic level species.

The intertidal zones, between the open waters of the Cooper River and its tributaries, and the uplands of NAVBASE, are host to numerous organisms including fiddler crabs (*Uca* spp.), mud crabs (*Eurytium* spp.), periwinkle (*Littorina* spp.), mud snails (*Nassarius* spp.), and a multitude of immature insects, oligochaetes, and annelid worms (FEIS 1995). These organisms play an important role in the intertidal ecosystem as detritus-algal feeders.

Threatened and Endangered Species — Several state-designated species of concern currently or historically have occurred on NAVBASE. Both federally and state-listed species are listed in Table 4-1.

Two buildings at NAVBASE (Buildings 224 and 657) are known to provide rooftop nesting sites for the least tern (*Sterna antillarum*), listed as state-threatened species. Typically, this species uses beach areas above the reach of ordinary high tide. However, due to the increased development pressures on their natural habitats, the terns have resorted to using rooftops with white crushed rock or pea gravel substrates. The use of these rooftop colonies likely fluctuates from year to year. Approximately 23 pairs were documented at NAVBASE in a 1994 nest count.

Wading-bird colonies have been established in the larger wooded tracts of land on the southern end of the base near Shipyard Creek. Typical species include white ibis (*Eudocimus albus*), little

Table 4-1
 Federally and State-Listed Threatened, Endangered, and Candidate Species
 That Occur or Potentially Occur on the Charleston Naval Base

Species		Residence Status	Status	
Common Name	Scientific Name		USF&WS	SCDNR
Plants				
Sea-Beach Amaranth (pigweed)	<i>Amaranthus pumilus</i>	UR	SR	NC
Canby's Dropwort	<i>Oxypolis canbyi</i>	UR	E	E
Cypress Knee Sedge	<i>Carex decomposita</i>	UR	SR	—
Sea Purslane	<i>Trianthema portulacasfrum</i>	CR	—	SC
Whisk Fern	<i>Psilotum nudum</i>	UR	—	SL
Climbing Fern	<i>Lygodium palmatum</i>	UR	—	SL
Piedmont Flatsedge	<i>Cyperus tetragonus</i>	PR	—	SL
Baldwin Nutrush	<i>Scleria baldwinii</i>	UR	—	SL
Nodding Pogonia	<i>Triphora trianthophora</i>	UR	—	SL
Savannah Milkweed	<i>Asclepias pedicellata</i>	UR	—	RC
Sweet Pinesap	<i>Monotropsis odorata</i>	UR	—	RC
Climbing Fetter-Bush	<i>Pieris phillyreifolia</i>	UR	—	SL
Pondberry	<i>Lindera melissifolia</i>	UR	E	E
Chaff-Seed	<i>Schwalbea americana</i>	UR	SR	NC
Incised Groovebur	<i>Agrimonia incisa</i>	UR	C2	NC
Venus Flytrap	<i>Dionaea muscipula</i>	UR	—	RC
Mammals				
West Indian Manatee	<i>Trichechus manatus</i>	PM	E	E
Bull's Island Deer	<i>Odocoileus virginianus</i>	UR	—	C2
Black Bear	<i>Ursus americanus</i>	UM	—	SC

Table 4-1
Federally and State-Listed Threatened, Endangered, and Candidate Species
That Occur or Potentially Occur on the Charleston Naval Base

Species		Residence Status	Status	
Common Name	Scientific Name		USF&WS	SCDNR
Birds				
Brown Pelican	<i>Pelicanus occidentalis</i>	LM	—	SC
Least Tern	<i>Sterna antillerum</i>	CR	—	T
American Swallow-tailed Kite	<i>Elanoides forficatus forficatus</i>	PM	SR	E
Arctic Peregrine Falcon	<i>Falco peregrinus tundrius</i>	PM	T	T
Bald Eagle	<i>Haliaeetus leucocephalus</i>	LM	E	E
Bachman's Warbler	<i>Vermivora bachmanii</i>	UR	E	E
Wood Stork	<i>Mycteria americana</i>	LM	E	E
Red-cockaded Woodpecker	<i>Picoides borealis</i>	UR	E	E
Osprey	<i>Pandion haliaetus</i>	CR	—	SC
Piping Plover	<i>Charadrius melodus</i>	PM	T	T
Bachman's Sparrow	<i>Aimophila aestivalis</i>	UR	SR	SR
Black Rail	<i>Lateralus jamaicensis</i>	PR	CR	C2
Loggerhead Shrike	<i>Lanius ludovicianus</i>	CR	—	C2
Fish				
Shortnose Sturgeon	<i>Acipenser brevirostrum</i>	LM	E	E
Reptiles and Amphibians				
American Alligator	<i>Alligator mississippiensis</i>	PR	T/SA	T/SA
Eastern Tiger Salamander	<i>Ambystoma tigrinum tigrinum</i>	UR	C2	SC
Broad-striped Dwarf Siren	<i>Pseudobranchius striatus</i>	PR	—	SC
Kemp's Ridley Sea Turtle	<i>Lepidochelys kempii</i>	PM	E	E
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	PM	E	T
Green Sea Turtle	<i>Chelonia mydas</i>	PM	T	E

Table 4-1
Federally and State-Listed Threatened, Endangered, and Candidate Species
That Occur or Potentially Occur on the Charleston Naval Base

Species		Residence Status	Status	
Common Name	Scientific Name		USF&WS	SCDNR
Reptiles and Amphibians (cont'd)				
Loggerhead Sea Turtle	<i>Caretta caretta</i>	PM	T	T
Island Glass Lizard	<i>Ophisaurus compressus</i>	UR	SR	SR
Gopher Frog	<i>Rana areolata capito</i>	PR	—	C2
Flatwoods Salamander	<i>Ambystoma cingulatum</i>	UR	C2	SC
Communities				
Least Tern Breeding Colony		CR	—	SC
Wading Bird Breeding Colony		CR	—	SC

Key:

CR	=	Confirmed Resident
SR	=	Status Review
R	=	Likely Resident
E	=	Endangered
PR	=	Possible Resident
T	=	Threatened
UR	=	Unlikely Resident
SL	=	State Listed
CM	=	Confirmed Migrant or Occasional Visitor
RC	=	Of Concern, Regional
LM	=	Likely Migrant or Occasional Visitor
NC	=	Of Concern, National
PM	=	Possible Migrant or Occasional Visitor
C2	=	Candidate Sp. for Fed. Listing, Cat. 2
UM	=	Unlikely Migrant or Occasional Visitor
T/SA	=	Threatened due to Similarity of Appearance
SC	=	Of Concern, State
USF&WS	=	U.S. Fish and Wildlife Service
SCDNR	=	South Carolina Department of Natural Resources

blue herons (*Florida caruea*), Louisiana herons (*Hydranassa tricolor*), snowy egrets (*Egretta thula*), cattle egrets (*Bulbulcus ibis*), and black-crowned night herons (*Nycticorax nycticorax*).

Wading-bird rookeries typically are in isolated areas with significant numbers of mature trees and snags that are 10 to 20 feet above the ground. Although the wooded areas used by the colony provide only marginal habitat, the use of the colony before, and its attempted resettlement after, Hurricane Hugo indicates the availability of suitable habitats in the Cooper River region may be limited.

The brown pelican (*Pelicanus occidentalis*), a state-listed species of concern, is recorded as using the Charleston Harbor estuary in the NAVBASE vicinity (E&E 1994). This species is likely only a visitor to the area, using the Cooper River and adjacent tidal creeks to forage. The species typically nests on small coastal islands and little potential nesting habitat is available on NAVBASE.

Also a state-listed species of concern and confirmed resident at NAVBASE, the osprey (*Pandion haliaetus*) often attempts to nest on cranes and ship masts. The adjacent waterways to NAVBASE provide excellent forage habitat for the osprey.

Sea purslane (*Trianthema portulacasfrum*), a plant classified as a South Carolina species of concern, is typically found along stream and irrigation ditches, and in sandy shores, flats, and banks. This rare vascular plant has been found on the dredge disposal area at the southern end of the base (Porcher 1993). Since this species is not listed as endangered or threatened, this plant has no legal protection in South Carolina.

4.2 NAVBASE ESA and AEC Habitat Descriptions

To obtain preliminary ecological information for areas within Zone J and determine the scope of proposed ERA efforts, a basewide habitat evaluation was conducted by E/A&H between

October 1994 and February 1995. NAVBASE properties and associated water bodies were divided into eight ESAs based on primary land usage and type and extent of development. Each ESA was surveyed by qualified environmental scientists to identify all potential AECs. Ecological checklists were first completed for each ESA and followed by an AEC-specific checklist. These lists are presented in Appendices A and B.

Several studies have been performed on and in the vicinity of NAVBASE by various agencies and environmental contractors including the USEPA, South Carolina Department of Natural Resources (SCDNR), National Oceanic and Atmospheric Agency (NOAA), USACOE, South Carolina Sea Grant Consortium, as well as several local universities. The topics of study include sediment/water quality and benthic diversity of the Cooper River and Shipyard Creek, and potential contamination in the DRMO area. Several studies have been conducted at NAVBASE proper, including a survey for rare and endangered species. Information obtained from the review of these studies was incorporated into the preliminary assessments and will be considered during subsequent stages of the Zone J RFI.

4.2.1 ESA I — Warehouse/DRMO Area

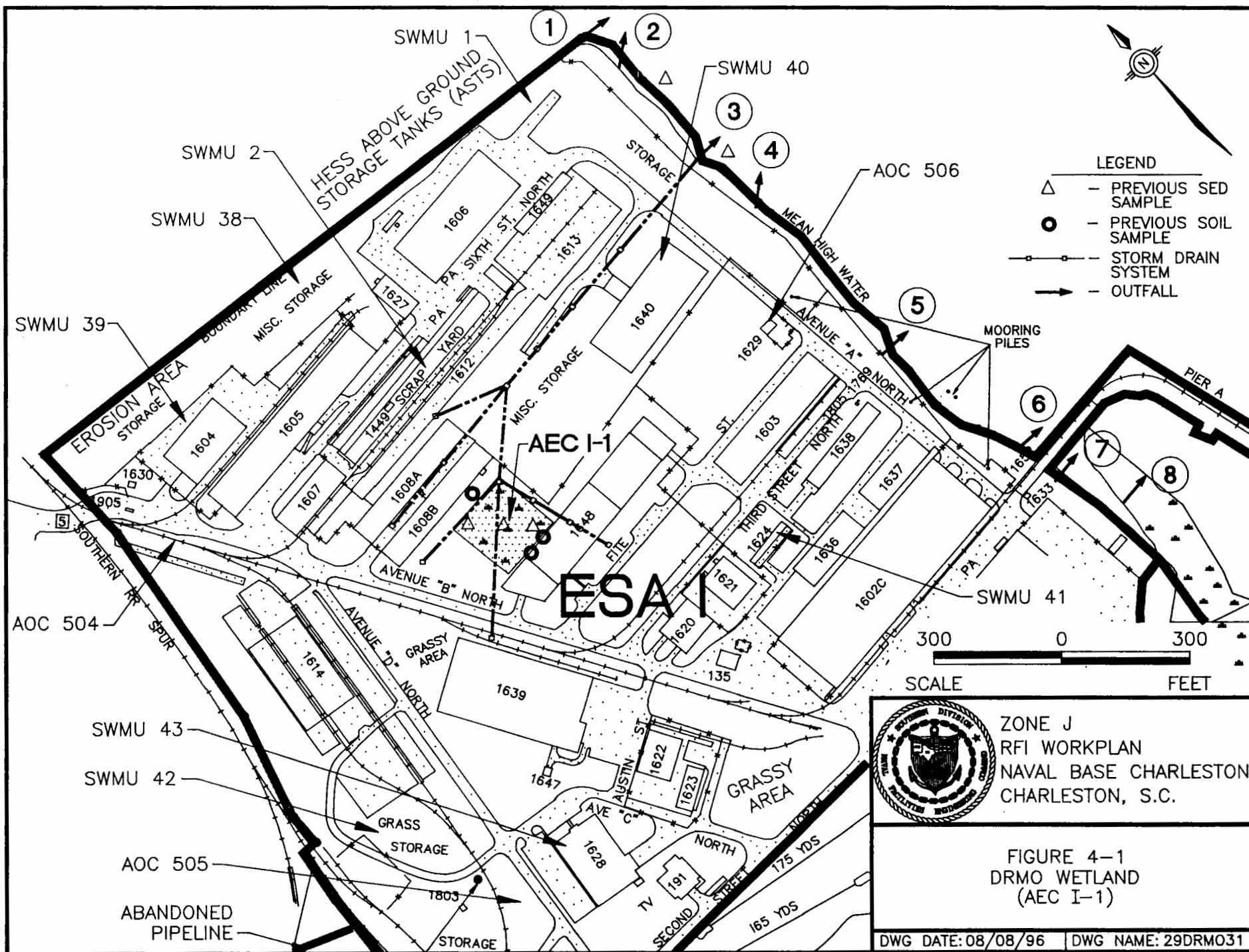
The predominant industrial features in ESA I are the DRMO and Fleet Industrial Supply Center (FISC), consisting of approximately 25 one-story linear warehouses and open storage areas. A small, isolated palustrine scrub-shrub wetland in a grassy area northwest of Building 1648 is the only AEC in this area potentially impacted from site activities (AEC I-1; Figure 4-1). Vegetation is thickest in the center of the 1-acre wetland and several small ornamental trees were planted on its western perimeter. This seasonally flooded wetland likely receives surface water runoff from the surrounding areas and, according to early NAVBASE storm drainage maps, may also receive discharge from a storm water drainage system. Piping and catch basins of this underground storm water system once ran beneath and on the north and east sides of the wetland area and ultimately lead through the DRMO area to the Cooper River (National Pollutant

Discharge Elimination System [NPDES] Outfall 3). The integrity of this drainage system and its influence on the AEC I-1 wetland is uncertain.

Two undeveloped areas also associated with ESA I are either of minimal ecological significance or located off Navy property and therefore were not classified as Zone J AECs. An approximately 4-acre grassy field with several trees is west of Avenue D. The only natural features in this maintained field are several mature oak trees (*Quercus* spp.). Crossing the western edge of this open area are several north-south railways which the RCRA Facility Assessment (RFA) has identified as part of AOC 504. Also present in the central portion of this area are SWMU 42, a former asphalt plant, and AOC 505, a cross-tie storage area. These sites will be investigated during the Zone L and A RFIs.

The offsite ecological feature, west of the field in ESA I, is a large estuarine intertidal emergent wetland which receives drainage from portions of North Charleston and high tide waters from the Cooper River via Noisette Creek. Two elevated pipelines cross the wetland and, upon reaching the NAVBASE property line, go below ground. According to base utility maps, the southernmost pipeline is a potable water main (Noisette Creek Connection) supplying water to the northern portion of NAVBASE. The northernmost pipeline is broken in several places and appears to be abandoned.

Eight identified storm water outfalls along the eastern shoreline of ESA I discharge directly to the Cooper River. The northernmost outfall is from an open ditch and culvert drainage system which conveys storm water eastward along the northern property line between a large, offsite aboveground storage tank (AST) farm and the DRMO open storage area. Three SWMUs are near this drainage system: SMWU 39, a petroleum/oil/lubricant drum storage area in the northwest corner of the ESA, and SWMUs 1 and 38, both DRMO open storage areas. Also in ESA I is SWMU 40, the DRMO Storage Shed, approximately 500 feet east of AEC I-1 and SWMU 2, the Scrap Bins, approximately 600 feet north. A portion of the NAVBASE railroad



Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

system (AOC 504) also runs through the study area, west of AEC I-1 and parallel to Avenue B North. Four secondary railways branch eastward from the main railway, running north of Building 1605, south of the scrap yard, along Third Street North and out to Pier A. These AOC/SWMUs are included in the Zone A and Zone L RFIs. The fringe wetlands and outfalls along the Cooper River will be addressed in both Zone A and Zone J.

Previous Investigations

Several site investigations have been conducted in ESA I. In March 1988, Environmental and Safety Designs, Inc. (EnSafe) prepared the *Report of Field Activities; Closure of Interim Status Hazardous Waste Facilities, Naval Shipyard, Charleston, South Carolina*, in which preclosure activities of the DRMO Storage Shed (SWMU 40) are summarized. The *Final Contamination and Exposure Assessment for Lead Contamination within the DRMO* (ESE 1986) found lead contamination in soil at SWMU 2 ranging from less than 1.3 to 371,000 milligrams per kilogram (mg/kg). The highest lead concentrations were in the area of the former battery storage bin, approximately 400 feet north of AEC I-1. Lead-in-soil concentrations exceeding 1,000 mg/kg were identified in an approximately 6-acre area, distinguishing lead as the primary contaminant of concern in ESA I. A 1993 investigation of SWMU 2, the scrap yard in the same area, indicates a less extensive area of lead contamination (E/A&H, 1993). A soil sample collected at the location previously exhibiting the highest lead concentration in ESE's 1986 investigation contained only 34 mg/kg lead at 0 to 1 foot bgs. The sampling locations with relative lead concentrations are presented in Figure 4-2.

As part of the Zone A RFI, three soil and three sediment samples were collected in AEC I-1 to preliminarily assess risk to the wetland area from contaminants associated with SWMU 2. Since lead was previously identified as the primary contaminants of concern, these samples were analyzed for only Appendix IX metals. Two sediment samples were also collected in the nearshore environment of the Cooper River near NPDES Outfalls 2 and 3. The analytical

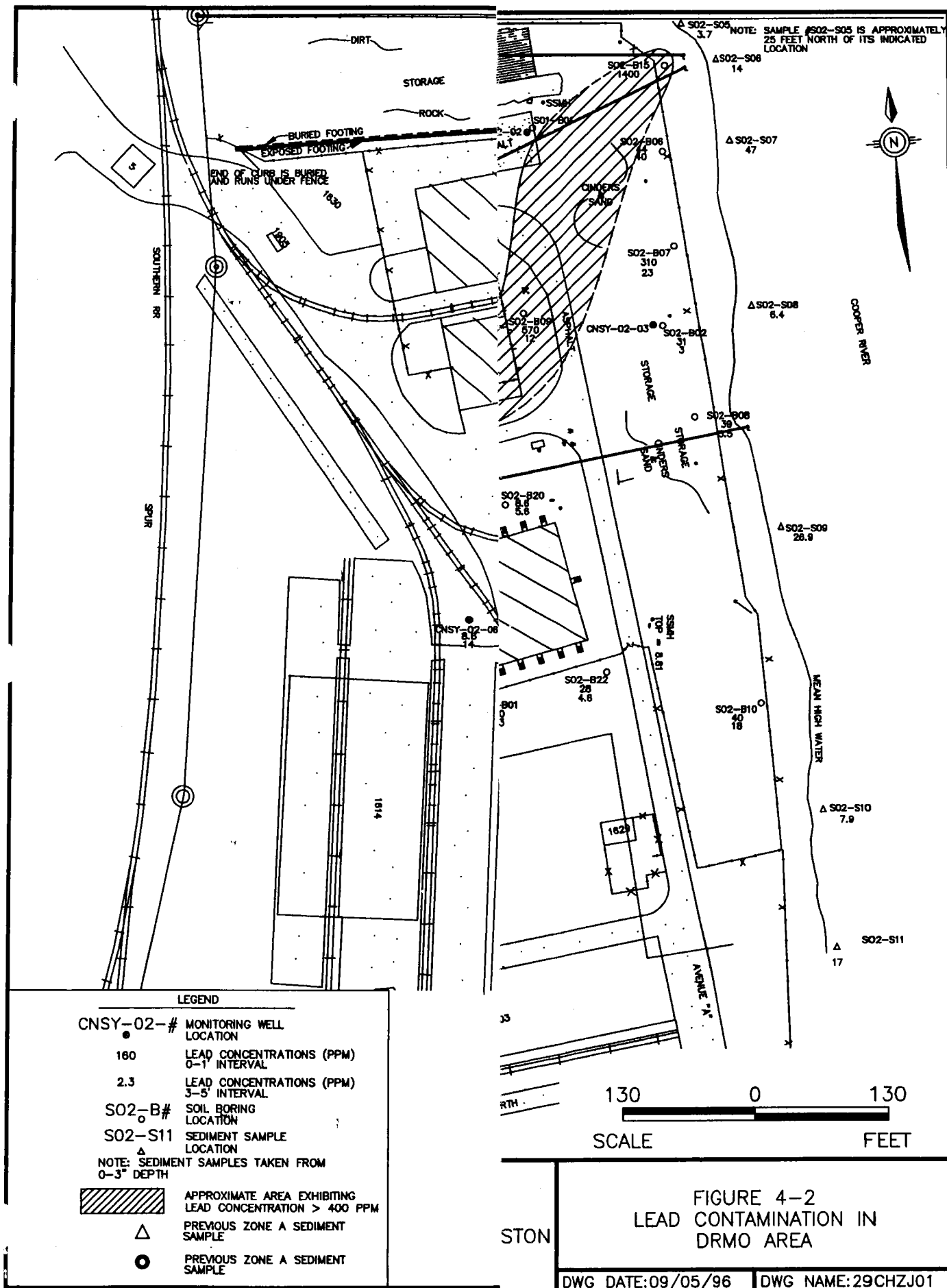
results of these Zone A samples, presented in the Draft *Zone A RFI Report*, will be considered during the assessment for both of these ecologically sensitive areas.

Phase I Conclusions

The AEC I-1 wetland is adjacent to two open storage areas to the north and east which currently store miscellaneous items including airplane tires, motor vehicles, metal shelving, cabinets, and lockers. A large warehouse (Building 1648) immediately to the south discharges storm water toward the wetland. The grassy field west of the wetland is also periodically flooded during heavy rains. The storm water system indicated on NAVBASE maps was not observed in or around the wetland, signifying that the catch basins have been either removed or filled. Two low areas are in the north and east corners, but no drains were evident. No other obvious outfalls or discharge points to the wetland were present, making surface water runoff and groundwater the most likely migration route to and from this wetland.

During the PSA, standing water approximately 1.5 to 2 feet deep in the central portion of the wetland was slightly turbid. Sediments in the deeper areas of standing water were dark brown with a moderate overlayer of detritus. A sheen was observed on the water surface in the shallower areas. Based on the dampness of surficial soil, hydric conditions are likely present several yards beyond its vegetated perimeter. Typical palustrine scrub-shrub wetland vegetation was present, with black willow (*Salix nigra*) and tallowtrees (*Sapium sebiferum*) dominant. A large willow (greater than 18 inches diameter) in the center of the wetland had been partially uprooted and is still showing new growth. The thick understory consisted of wax myrtle (*Myrica cerifera*), common elderberry (*Sambucus canadensis*), and cattail (*Typha latifolia*) with both tall grass and broad-leaf herbaceous plants covering most of the ground. Submergent and emergent vegetation was also present in the deeper waters.

Avifauna were abundant in the small isolated wetland, with red-wing black bird, boat-tailed grackle, and starling foraging throughout. A nesting mourning dove (*Zengida macroura*) was



observed in the low branches of a willow tree on the southern perimeter. Appropriate habitat indicates that small mammals may also be present, although no tracks were observed. Small minnow-size fish were also observed in the areas of ponded water. During the Zone A sampling efforts at AEC I-1, there was no standing water, prohibiting the collection of surface water samples.

Sampling Plan

Previous Zone A sampling locations for the preliminary assessment of risk are presented in Figures 4-1 and 4-2. These soil/sediment samples will help characterize the COPCs within the wetland. Based on review of preliminary data, biological receptors at AEC I-1 may be potentially impacted due to lead contamination in the DRMO area (SWMU 2). Conclusions of this sampling event will be presented in the Zone A RFI Report. If the risk potential to the AEC is confirmed, the Zone J RFI process will complete the ERA.

4.2.2 ESA II — Golf Course/Noisette Creek/Officer Housing

Primary land uses in ESA II are recreational and residential with an 18-hole golf course occupying the northern half and officer housing occupying the southern half. Noisette Creek, a small, tidally influenced tributary, flows eastward through the golf course to the Cooper River (AEC II-1, Figure 4-3). Noisette Creek, along with a small pond and several acres of wetlands, is the only identified AEC within ESA II. According to base drainage maps, the creek receives surface and storm water runoff from the golf course as well as off-base properties upstream.

According to the National Wetland Inventory and FEIS, Noisette Creek is associated with several wetland types: estuarine subtidal, estuarine intertidal, and palustrine forested. The subtidal wetlands consist of the open-water, nonvegetated portion of Noisette Creek that does not become exposed at low tide. This wetland type has been classified as having unconsolidated bottom substrate (FEIS 1995). The intertidal wetland consists of the frequently flooded marshes and mud flats on the margins of Noisette Creek. The near-shore areas within these wetlands are

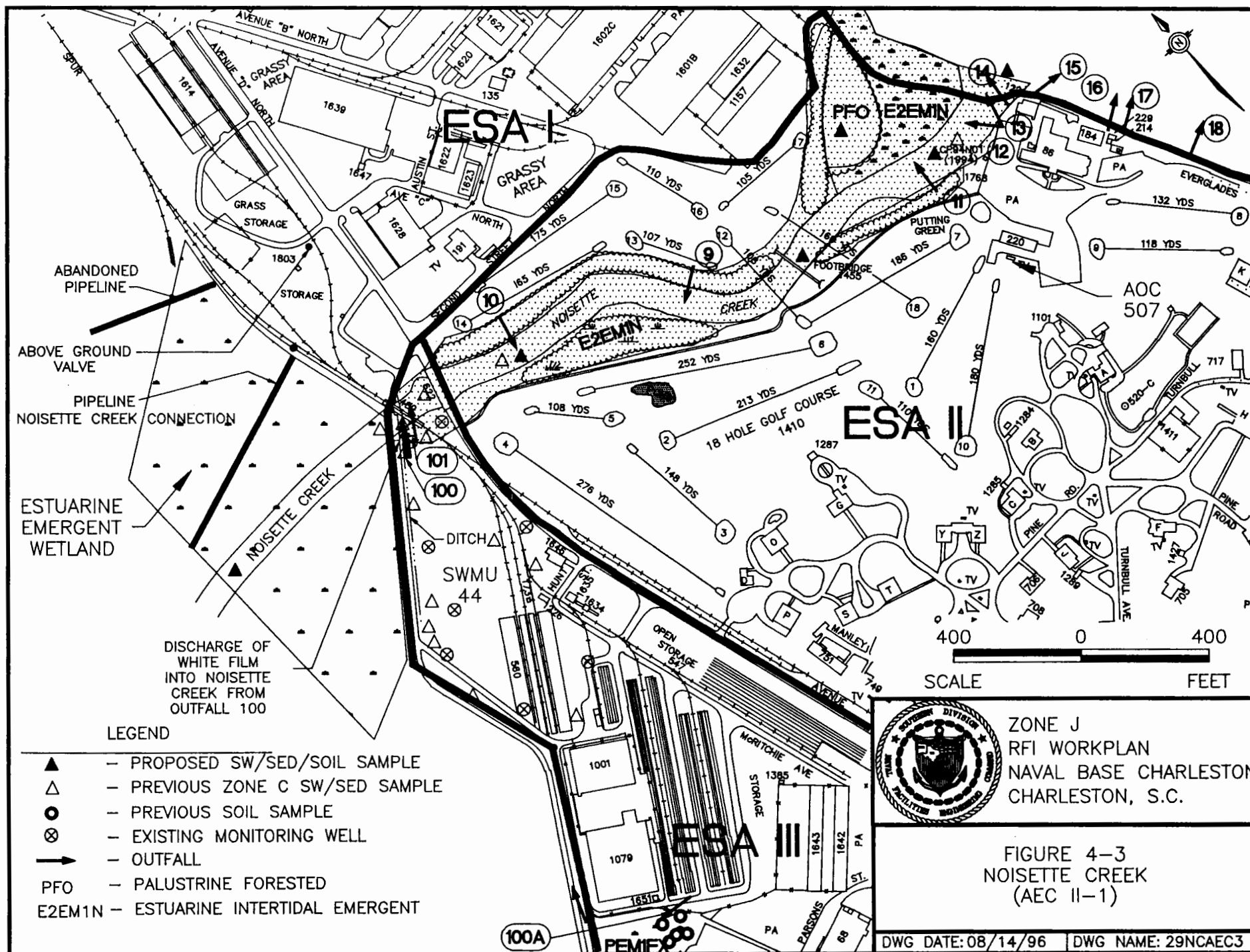
characterized by dense stands of halophytic vegetation including smooth cordgrass (*Spartina alterniflora*) with patches of saltmeadow cordgrass (*Spartina patens*) and black needlerush (*Juncus roemerianus*).

An area at the mouth of Noisette Creek has been identified as a palustrine forested wetland. This area abuts frequently flooded *Spartina* marsh and is dominated by willow and oak. Estuarine influence in this tidal drainage is indicated by the high number of periwinkle and snail shells on the ground. Little herbaceous vegetation is present, indicating extended inundation; a defined drainage channel also is present. Information regarding physical attributes, such as mean depth, was not determined during the preliminary ESA survey.

A small golf course pond is approximately 300 feet south of Noisette Creek, near the fairway to the sixth hole. According to base storm drainage maps, this pond receives runoff from various golf course drains near the pond (the farthest being less than 600 feet south). Any overflow from the pond flows through an underground pipe into Noisette Creek.

Officer's housing occupies the remaining southern portion of the ESA. The homes are surrounded with well-maintained lawns landscaped with both native and exotic trees and shrubs. Typical tree species include a wide variety of oaks (*Quercus* spp.) with many of the mature trees draped with Spanish moss (*Tillandsia usneoides*). Other species include pines (*Pinus* spp.), maples (*Acer* spp.), and magnolias (*Magnolia* spp.). Planted shrubs include privet (*Ligustrum* spp.), and laurels and azaleas (both *Rhododendron* spp.). As a residential area with limited ecological significance, this area was not designated as an AEC.

Eight identified storm water outfalls are along Noisette Creek's half-mile run through naval property. The first NAVBASE outfalls that discharge into the creek drain the Coal Storage Area (SWMU 44/Zone C) and are in the extreme northern portion of ESA III.



Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

The only facility within ESA II which was designated by the RFA as a potential source of contaminants is AOC 507 (Zone B), an oil storage house west of Building 220, approximately 400 feet south of Noisette Creek. According to storm drainage maps, a storm sewer line runs near AOC 507 and discharges into Noisette Creek. The distance between any storm water drainage basins and the AOC has not been determined; therefore, the potential of the sewer line as a contaminant migration pathway to Noisette Creek is uncertain. Two sites (AOC 505 and SWMU 42) in nearby ESA I that may also impact AEC II-1 via surface water runoff or groundwater discharge will be addressed in the Zone A RFI.

Previous Investigations

The Zone C RFI has investigated SWMU 44 and, through recent surface water and sediment sampling along the drainage ways near the site and at outfalls 100/101, has obtained preliminary risk assessment data for potential impacts to Noisette Creek from SWMU 44. These data, once evaluated, will be incorporated into the assessment of Noisette Creek. Analysis of SWMU 44 surficial soil samples indicated elevated concentrations of arsenic and aluminum. Surface water samples collected above and below the outfalls contained only low-level concentrations of metals.

Noisette Creek was included in a study by the Marine Resources Research Institute (MRRI) entitled *Year One Demonstration Project Studies Conducted in the Carolinian Province* (Final Report, September 1995). Water quality parameters, sediment characteristics, sediment contaminants, sediment toxicity tests, benthic communities, and nektonic (free-swimming) assemblages were evaluated from 84 sites from Virginia to Florida. One location in Noisette Creek (CP94NOI) was selected as a supplemental station and sampled during the summer of the pilot year, 1994. Due to the large scale of the figure presented in the MRRI report, the sampling location on Figure 4-3 is approximate.

Although comprehensive sampling was not conducted at the supplemental stations, sediment samples were collected for contaminant analyses, characterization, and toxicity testing.

Unfortunately, sediment results from Noisette Creek were not presented in the MRRI's report, perhaps because the creek was a new site and results may not have been available. However, results from bioaccumulation studies on oysters and clams deployed in the creek were given. Adverse effects on oyster and clam growth rates were observed. Clams also experienced a high mortality (60%), which was attributed in part to the low salinity in Noisette Creek. MRRI concluded that conditions in Noisette Creek were possibly toxic based on Microtox® and seed clam toxicity tests.

AEC II-1 Phase I Conclusions

AEC II-1 includes approximately 10 acres of open water, wetland, and riparian habitat, all associated with Noisette Creek. The natural habitats of the AEC are accurately described above. Anthropogenic features of the 0.5 mile of the tidal creek on NAVBASE include the outfalls along the bank and the portion of the southern shoreline near the creek's mouth which has been reinforced with riprap, concrete debris, and a seawall to control erosion. Two bridges are upstream at the western property line, one for railcars, another for motor vehicles. A small footbridge provides access across the creek's central portion.

Vegetation in the riparian zone along both banks is dominated by southern hackberry trees, wax myrtle with smaller populations of live oak (*Quercus virginiana*), privet (*Ligustrum sp.*), eastern red cedar (*Juniperus silicicola*), yaupon (*Ilex vomitoria*), saw palmetto (*Serenoa repens*), mulberry (*Morus sp.*), chokecherry (*Prunus virginiana*), french tamarisk (*Tamarix gallica*), and black willow trees. The wetland vegetation is typical of estuarine emergent habitats with smooth cordgrass, black needlerush, and cattail. Bird species observed during the PSA include barn swallow, white egret, red-wing blackbird, osprey, and pied-billed grebe (*Podilymbus podiceps*). Raccoon tracks were also observed along the muddy shoreline. Pilings beneath bridges accommodated numerous clusters of oyster shells.

Noisette Creek is heavily influenced by the tides, with several undercut areas along the bank where tidal flow has accelerated erosion. The banks are on average 3 to 6 feet above the water, depending on the tide. High tides occasionally combine with heavy rains and cause the tidal creek to spill over banks and flood portions of the surrounding golf course. A sump and pump have been dedicated to a low-lying area on the course immediately south of the creek because of such events. The brackish water in the creek was turbid and the bottom only visible at the mouth and then only at low tide. Visible substrate within the creek consists of marl, gravel, and muck with smaller areas of detritus and debris.

Sampling Plan

AEC II-1 is considered to be potentially impacted due to the proximity of Noisette Creek to the golf course (a suspected source of herbicide and pesticide runoff), the presence of numerous storm water outfalls, and runoff from SWMUs 42 and 44, and AOC 507. These suspect activities, along with MRRI's findings, prompt the ERA process to proceed to Phase II Contamination Assessment.

Tentative sampling locations for the complete assessment of Noisette Creek (AEC II-1) are presented in Figure 4-3. Six surface water/sediment samples are proposed to characterize the COPCs within Noisette Creek and the associated wetlands. These sampling locations are designed to complement the AOC/SWMU sampling plans for the Zone A, B, and C RFIs.

4.2.3 ESA III — Northern Industrialized Area

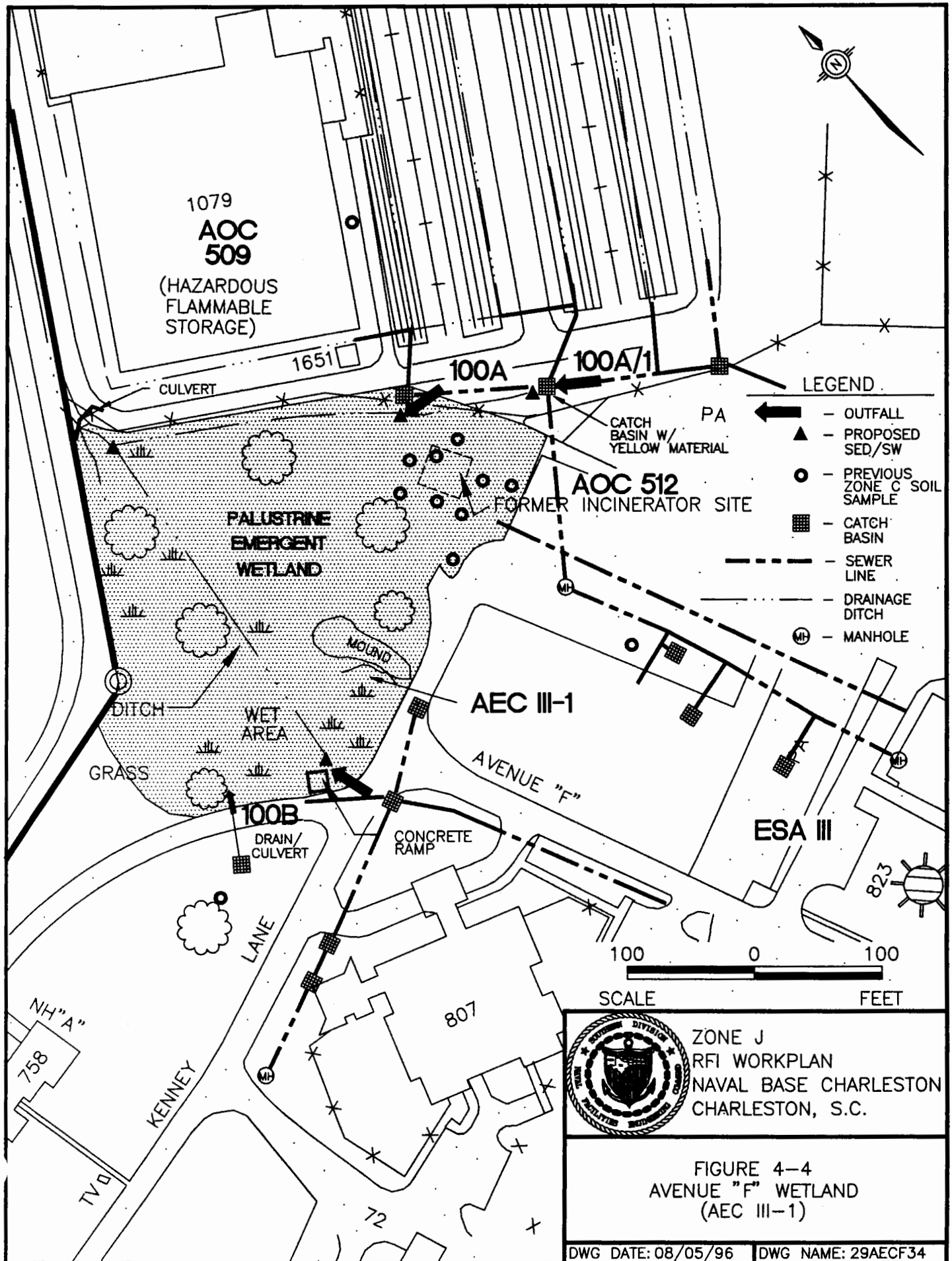
Including both the naval shipyard and controlled industrial area, ESA III contains the most industrialized areas on base and, as such, has only three AECs. An approximately 1.5-acre undeveloped palustrine emergent, persistent, semipermanently-flooded wetland (AEC III-1; Figure 4-4) is northeast of Avenue F and Kenney Lane. AOC 512, a former incinerator site in the eastern portion of this AEC, has been investigated as part of the Zone C RFI.

AEC III-1 — Storm drainage maps of this grassy area indicate that AEC III-1 receives storm water discharge from drainage lines and open ditches in the railcar staging area near Building 1079 to the north and from the numerous storm sewer lines to the south (NPDES outfalls 100A and 100B). This wetland also receives storm water from a catch basin in a low-lying area of the lawn 50 feet to the southwest.

AEC III-2 — Also in ESA III is Facility 910, a storm water detention pond at the northeast corner of McMillan and St. John's avenues (AEC III-2; Figure 4-5). The 9,722-square-foot pond is approximately 10 feet below grade with steeply sloped, grass-covered banks. The pond is separated into two basins by a thick cement dike equipped with spillways to control the water level. The pond receives water from a pumping station on McMillan Avenue as well as storm water runoff from St. John's Avenue and Commissary Street. Several perimeter culverts drain directly into the basin. According to base drainage maps, water from this detention system ultimately discharges to the Cooper River.

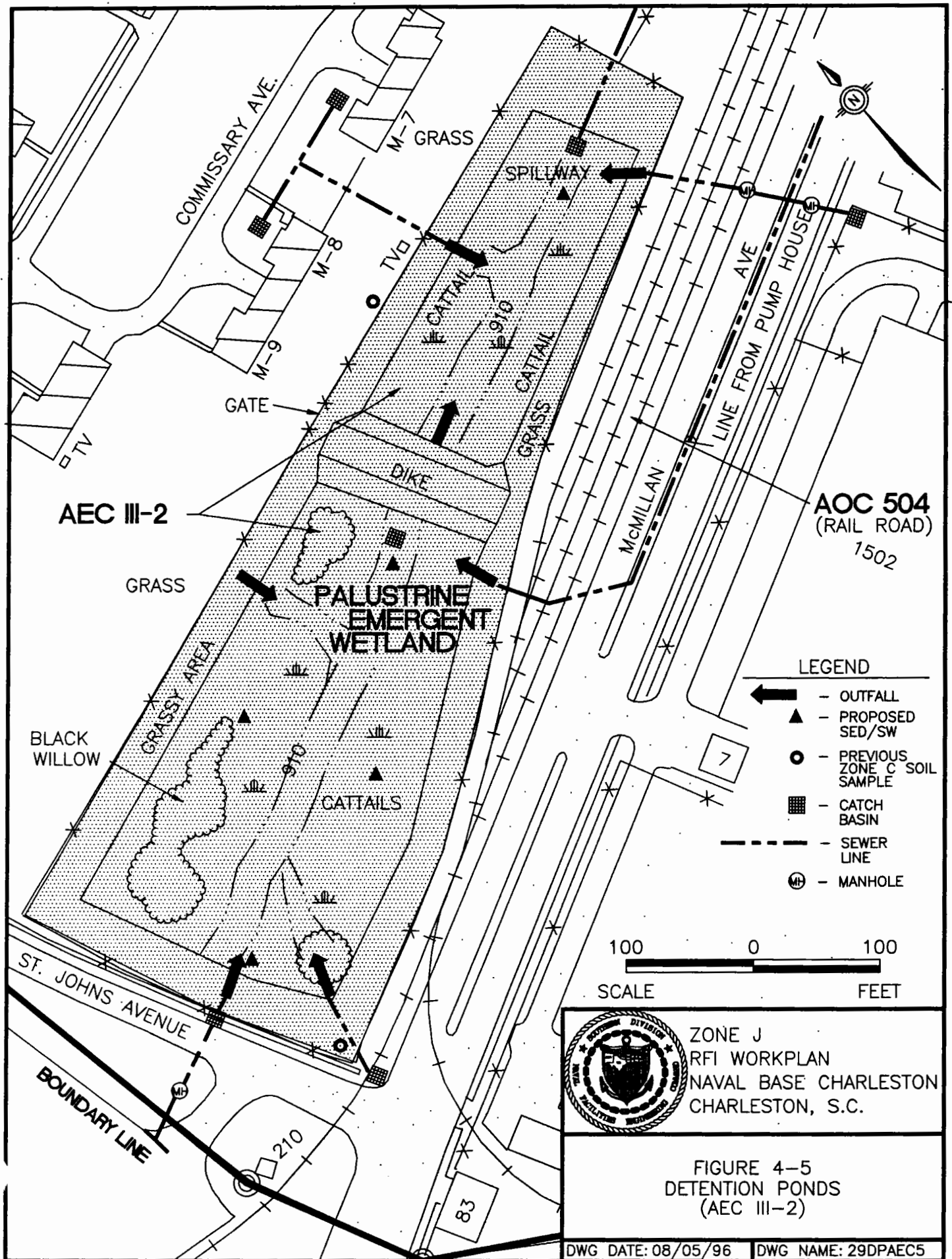
The man-made detention pond is identified on National Wetland Inventory maps as a semipermanently flooded, palustrine emergent persistent wetland. Cattail is present in both detention basins with patches of various other wetland species, including sedges (*Carex* spp.) and rushes (*Juncus* spp.). Submerged vegetation also was observed in the standing water at the west bank. A small, enclosed transformer station is also immediately outside the northern fenceline of the eastern basin but it exhibited no signs of spills or leakage. A portion of the NAVBASE railroad system (AOC 504) which also runs parallel to the pond will be addressed during the Zone L RFI.

AEC III-3 — The third AEC identified in ESA III is the eastern edge of a palustrine emergent wetland extending across the western property line near Building 1794 (AEC III-3; Figure 4-6). Drainage maps indicate that water from this wetland ultimately discharges to the Cooper River at Outfall 37. Approximately 400 feet northeast of this wetland area are SWMUs 3 and 24, a



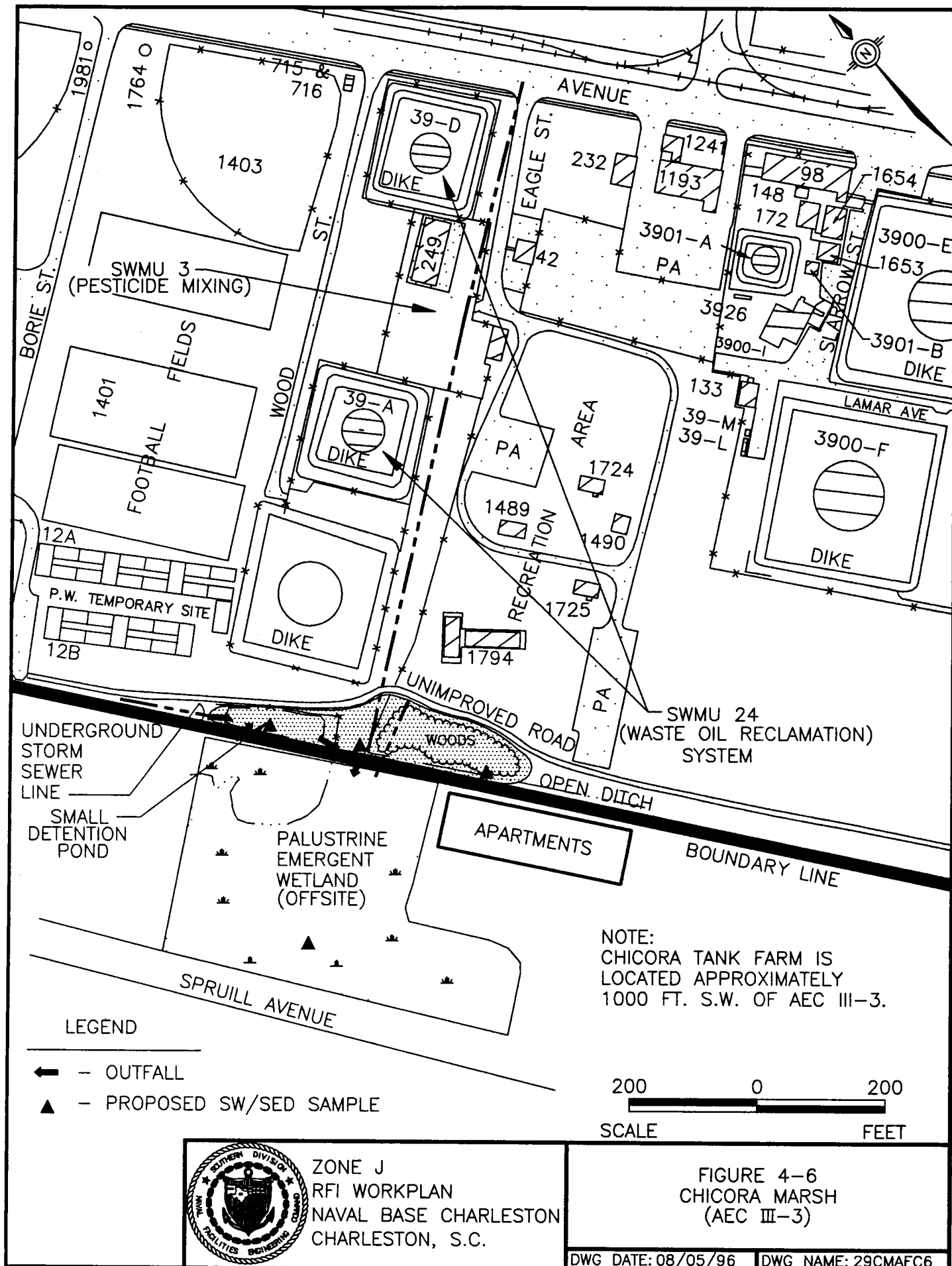
Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.



Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.



ZONE J
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4-6
CHICORA MARSH
(AEC III-3)

DWG DATE: 08/05/96

DWG NAME: 29CMAEC6

Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

pesticide mixing area at Building 249 and a waste oil reclamation facility in the fuel farm area. These sites and the associated potential pathways to AEC III-3 will be investigated during the Zone G RFI. An offsite suspected source of contamination to this marshy AEC is the Chicora Tank Farm, approximately 0.5 mile west. The tank farm, described below, will be investigated under both the Zone G RFI and the Navy's tank closure program.

Previous Investigations

AEC III-1 — The Zone C RFI has collected 12 soil samples within AEC III-1 in response to the presence of a former incinerator (AOC 512). Results of this sampling effort are presented in the Draft *Zone C RFI Report*. Nine of these sample locations were biased to the suspected site of the incinerator and three were Zone C grid-based samples within 300 feet of the AOC. Three of the biased samples were found to contain elevated concentrations of benzo(a)pyrene. This semivolatile compound was detected in numerous surface soil samples from across the base and is suspected to be associated with the prolific use of boiler clinker as a substrate in NAVBASE road construction and fill material. Although the grid-based sub-surface soil sample collected approximately 150 feet south of the AOC exhibited aluminum and mercury concentrations slightly above the respective RBCs, these concentrations were encountered at the second interval beneath an unused asphalt parking lot and are, therefore, not considered risks to ecological receptors at the AEC.

AEC III-2 — Two additional Zone C grid-based samples were collected near the detention ponds; one at the northwest corner of McMillan and St. John's avenues and one along the fenceline approximately 50 feet west of the transformer vault between Building M-8 and the detention ponds. These were analyzed for metals only and neither soil sampling location indicated any significant contamination.

AEC III-3 — The Chicora Tank Farm, which has recently been assessed for contaminants (FEIS 1995) may potentially impact AEC III-3. Chicora's six large-capacity fuel USTs are

connected to a subsurface drainage system which discharges into a spill containment pond on the northwest portion of the tank farm. All water that enters the pond flows through a drainage ditch into the marshy tidal slough adjacent to the tank farm's northern boundary. The 1995 report concluded that the high concentrations of petroleum constituents (benzene, toluene, ethylbenzene, xylene [BTEX]; PAHs; and total petroleum hydrocarbons [TPH]) were identified in soil and sediment in the spill containment pond. TPH was found at concentrations as high as 1,200 mg/kg.

Phase I Conclusions

AEC III-1

The majority of this area is a low-lying, open field with two deep and narrow drainage ditches. One ditch flows north from Outfall 100B through the center of the field. The area surrounding the outfall (approximately 25% of the field) is regularly flooded, resulting in a community of hydrophytic vegetation and suspected wetland hydrology. A second ditch runs westward from Outfall 100A along the field's northeastern perimeter and receives discharge from a second outfall approximately 150 feet east of 100A. According to the base drainage map, this outfall is associated with both the storm drains in a nearby parking area and the open ditches in the railcar staging area. This outfall has a small catch basin which receives the initial discharge to the ditch in which an unidentified brownish-yellow flocculent layer was floating. Approximately 50 feet west of the basin, two long, narrow cement beams, possible remnants of the incinerator, span the ditch. Another potential impact to the perimeter ditch is from surface water runoff indicated by surface erosion and lack of vegetation between the southern facade of Building 1079 and the ditch. The two ditches in the AEC ultimately converge at its northernmost corner and flow into a large culvert. The culvert passes under the dirt road near Building 1079 to an offsite drainage ditch along St. John's Avenue and, according to base drainage maps, ultimately into Noisette Creek (AEC II-1) 2,300 feet north.

Other than the concrete beams, the only possible evidence of former incinerator activity is a grass-covered mound west of what is thought to be the location of AOC 512 and a small cement ramp west of Outfall 100B, which leads from Avenue F down into the wetland. Both are of unknown origin.

Dominant vegetation within the upland area of AEC III-1 is tall grass with scattered tallowtrees, indicative of disturbed areas. Live oak, possumhaw viburnum (*Viburnum nudum*), and southern hackberry (*Celtis laevigata*) are also present, but in fewer numbers. Scrub-shrub vegetation includes cattail, needlerush, and sedge grasses present in and around the drainage ditches. The pools of standing water in the ditches supports minnow-size fish and amphibians, including large bullfrogs (*Rana catesbeiana*). Loggerhead shrike, mourning doves, starlings, grackle, and red-wing blackbirds were also present.

Sampling Plan — AEC III-1 includes or is near two known AOCs (512 and 509) and receives storm water from surface runoff and several outfalls. Past incinerator activities warrant expanded sampling to determine impact from airborne contaminants upon the AEC. These conditions indicate that the AEC is potentially impacted and prompt the ERA process to proceed to Phase II Contamination Assessment.

To assess impacts to the entire wetland, four surface water/sediment samples are proposed in AEC III-1: one at each of the three storm water outfalls leading into the AEC to assess onsite contaminant migration and one at the northern culvert to assess offsite migration. Due to the presence of the former incinerator, all AEC III-1 sediment samples will also be analyzed for dioxins.

AEC III-2

The McMillan Avenue detention pond, between a residential area to the north, light industrial areas to the south, and a rail yard (part of AOC 504) next to the southern fenceline, is

considered an AEC because it supports wetland conditions. According to the base drainage maps and field observations, there are five outfalls into the pond, three in the western basin and two into the eastern basin. These outfalls originate from the adjacent St. John's and McMillan avenues as well as from Commissary Street, 150 feet to the north. A sixth outfall, not indicated on the base drainage map, was observed at the north side of the west basin and also likely receives runoff from Commissary Street. Regular discharge from these outfalls is indicated by distinct channelization through the thick emergent vegetation in the basins. A main center channel, approximately 10 to 15 feet wide, runs the entire length of both basins, tracking an easterly drainage pattern.

The sloped perimeter of the pond is grassy with patches of scrub-shrub, dominated by black willow. Cattail, arrowhead (*Sagittaria latifolia*), sedge, and cordgrass compose most of the emergent vegetation in the basins. Birds observed during the PSA include mourning dove, boat-tailed grackle, starling, mockingbird, green-backed heron (*Butorides striata*), and several snowy egrets (*Egretta thula*).

Sampling Plan — As expected, numerous storm water outfalls associated with the AEC III-2 drainage/detention system originate from roadside storm drains, including three near the adjacent AOC 504 rail yard. Although the pair of Zone C grid-based samples did not detect any metal contamination, the potential for contaminants associated with AOC 504 (petroleum, oils, lubricants, etc.) to impact the AEC prompts the ERA process to proceed to Phase II Contamination Assessment.

Five surface water/sediment samples are therefore proposed for AEC III-2, four in the western basin (two at each end of the main channel and two in the low-flow marginal areas) and one at the spillway of the eastern basin.

AEC III-3

The PSA of this AEC confirmed the presence of both a small wetland area surrounding the outfalls and a small, separate, overgrown detention pond. As indicated on base drainage maps, the primary wetland receives discharge from two Navy storm water outfalls — an elevated pipeline approximately 5 feet above the surface of the water, which appeared to be inoperative, and an outfall at water level which was obviously discharging into the wetland. The pipeline to this outfall runs past two waste oil tanks (SWMU 24) and a pesticide mixing area (SWMU 3). Each SWMU will be addressed in the Zone G RFI.

Two additional drainage ways which run parallel to and east of the Navy fenceline on either side of the outfall also discharge into the wetland, although neither appears on base drainage maps. The drainage way south of the outfall is a deep-cut, open ditch between the Navy fenceline and a small stand of trees on the high eastern bank. The source of discharge immediately north of the outfall is an underground pipe which empties into a small, fenced-in detention pond (approximately 150 by 20 feet). The pipe discharges to the northwest corner of the pond, which retains the water until it overflows into a corrugated metal culvert. The overflow discharges directly into the wetland through the southwest berm. During the site visit, the water level in the pond, although 1 to 2 feet below the level of its banks, was significantly higher than the water in the wetland, indicating an impermeable bottom within the detention pond. The banks of the detention pond appear to be man-made, as evidenced by riprap and concrete debris. Based on systems with similar design features, it is suspected that the detention pond was engineered to reduce the velocity of the pipeline's discharge directly into the wetland.

Dominant vegetation at AEC III-3 includes wax myrtle, black willow, red mulberry, and tallowtrees in both the small wooded portion along the eastern ditch and around the detention pond. The offsite wetland has typical emergent marshland vegetation, primarily cordgrass and needlerush. A large mammal live-trap was set along the eastern fenceline, reportedly part of

the basewide effort to control wild dogs. Bird species at the AEC include red-wing blackbird, boat-tailed grackle, and an osprey, which was seen foraging over the large, offsite wetland.

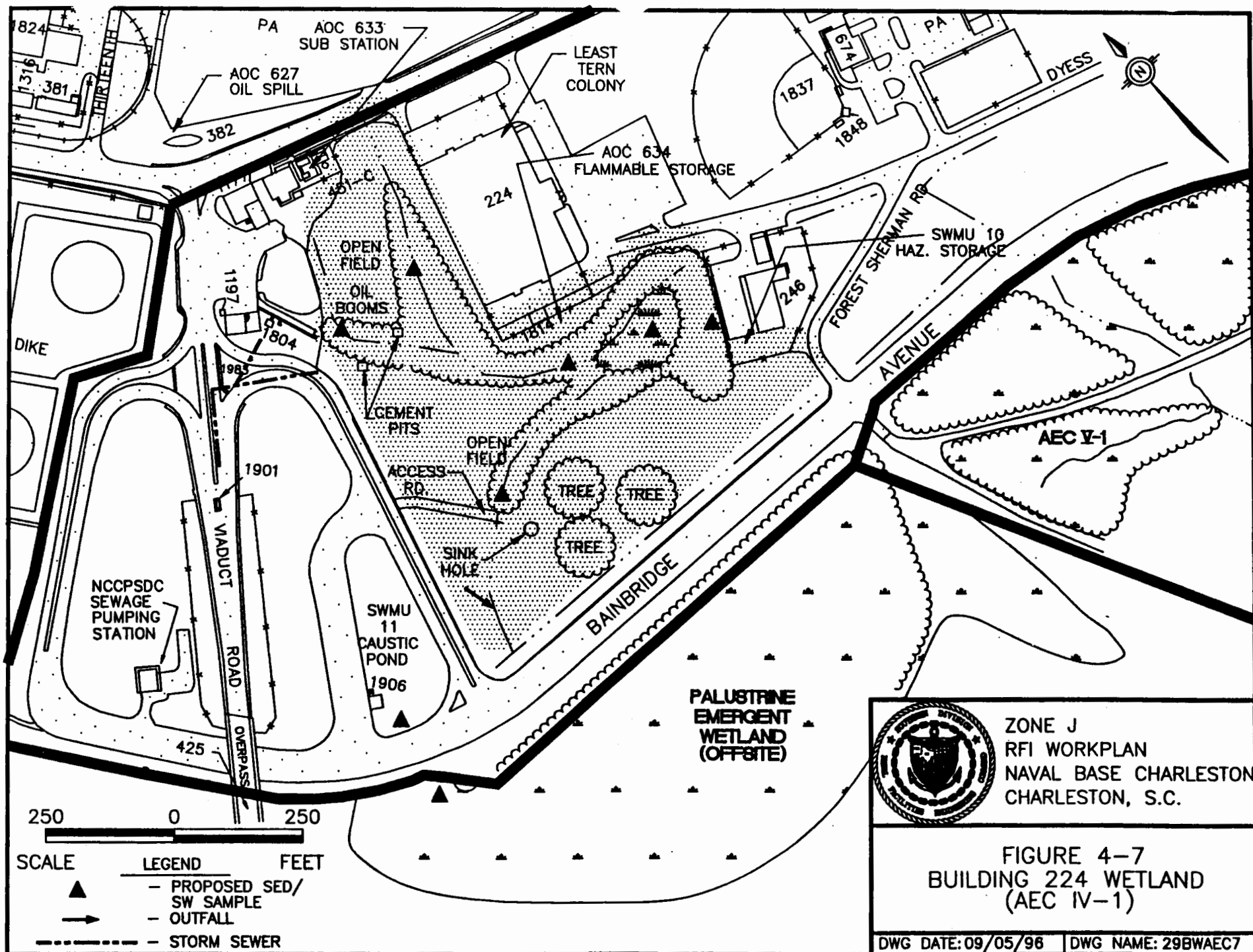
Sampling Plan — AEC III-3 receives discharge from a drainage line which passes two known SWMUs. Although no environmental media associated with these sites have yet been sampled, the potential exists for contaminants from both past and present activities to impact the AEC, prompting the ERA process to proceed to Phase II Contamination Assessment.

Four surface water/sediment samples are proposed for AEC III-3: one at the pair of outfalls which discharge directly into the wetland, one in the small detention pond, one in the eastern ditch, and one in the center of the large offsite wetland. These preliminary samples (see Figure 4-6) will be collected as part of the Zone G RFI.

4.2.4 ESA IV — Southern Industrialized Area

Similar to ESA III, the largely developed areas in ESA IV accommodate only a single AEC. An approximately 5-acre open field and palustrine scrub-shrub wetland area is immediately west of Warehouse 224 (AEC IV-1; Figure 4-7). Drainage from this area flows via open ditches and culverts to an expansive palustrine emergent/persistent wetland south across Bainbridge Avenue. In addition, two buildings in ESA IV, Warehouse 224 and Building 657, the Enlisted Club, have historically harbored nesting colonies for the state-listed threatened least tern (FEIS 1995). These rooftops were not designated as AECs since the risk to the colonies is not from potential contamination but rather potential loss of an established nesting site from possible renovation or demolition of the buildings. The SCDNR has recommended that the terns not be disturbed and that access to the rooftops be restricted during the nesting season.

The RFA has identified two SWMUs and three AOCs near AEC IV-1: SWMU 10, a hazardous waste storage area at Building 246; SWMU 11, a former caustic pond near Building 1906; AOC 627, the site of an oil spill near Hobson Avenue and Viaduct Road; AOC 633, a



Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

transformer substation; and AOC 634, a flammable storage shelter west of Building 224. Each of these sites will be included in the Zone G RFI.

AEC IV-1 Phase I Conclusions

AEC IV-1 is an approximately 5-acre area with both a heavily overgrown drainage system to the east and a maintained field with several trees to the west. The eastern ditches form a scrub-shrub wetland which is vegetated along its entire perimeter. An open, marsh area is in the center of the southeastern portion of the wetland, created by the widening of the drainage channel.

Evidence of a previous spill and potential contaminant migration to the wetland portion of the AEC was observed in the northern drainage ditches which originate near Building 1804 and 451-C. Two oil booms across each of the two ditches were visibly stained, perhaps in response to the reported oil spill at AOC 627. Two cement pits with metal covers are also present in the overgrown margins near the oil booms and are likely to be associated with storm water drainage. On the storm water drainage map for NAVBASE, a sewer line is indicated along the Viaduct Avenue, leading from the road to the northernmost pit. The purpose of the second pit is not certain. Also according the base map, the manhole, present at the terminal point of the northeast ditch, is associated with the drainage of Building 224's eastern parking lot. Concrete and metal debris are also present among the wetland's southwest vegetated perimeter, indicating the likelihood that solid waste has been disposed of within the marsh.

Two unpaved access roads, one from Viaduct Road and one from Forest Sherman Road, lead to a picnic area beneath the trees in the open field. A small drainage ditch in the open field also leads from the vegetated portion of the AEC to a ditch along Bainbridge Avenue. An unidentified outfall, approximately 50 feet upgradient from the roadside ditch, also discharges into the small ditch. Several small depressions or sink holes (approximately 10 inches deep)

of unknown origin are in the open field south of the intersection of the small drainage ditch and dirt access road.

Vegetation around the AEC IV-1 wetland consists primarily of wax myrtle and tallowtrees. Also present in the perimeter are southern hackberry, red mulberry, black willow, eastern red cedar, yaupon, and saw palmetto. The marshy area supports cattail and patches of cordgrass. The mature trees (greater than 12 inches diameter at breast height) in the open grassy area are red mulberry and southern hackberry. Bird species observed in the AEC include mockingbird, boat-tailed grackle, starling, mourning dove, osprey, and loggerhead shrike. Several nests were also observed. Reptiles confirmed to be present at the AEC include the eastern glass lizard (*Ophisaurus ventralis*) and the green anole (*Anolis carolinensis*).

Sampling Plan

Evidence of past spill(s), solid waste disposal, and several drainage features with uncertain origins were observed during the PSA of AEC IV-1. The AEC is also near several known AOC/SWMUs. The potential therefore exists for contaminants from both past and present activities to impact the AEC, prompting the ERA process to proceed to Phase II Contamination Assessment.

Eight surface water and/or sediment samples are proposed for AEC IV-1: three within the ditches leading into the wetland area, one in the center of the marsh area, one at the western drainage ditch where it crosses beneath the dirt access road, and one at the unknown outfall. Two additional samples will be collected at each side of the culvert leading from SWMU 11 into the large offsite wetland. These eight samples will be collected as part of the Zone G RFI.

4.2.5 ESA V — Southern Open Areas

With less than 10 buildings present, ESA V contains the largest portion of undeveloped land at NAVBASE, including several expansive wetlands. Being a large and contiguous area, ESA V

was divided into three smaller AECs. The palustrine forested wetland surrounding the headwaters of Shipyard Creek has been designated as AEC V-1. This area drains a large offsite wetland south of Viaduct and Bainbridge roads (Figure 4-8). The RFA has designated two SMWUs near AEC V-1. SWMU 19, an approximately 1-acre solid waste transfer station, and SWMU 20, an approximately 6-acre field near Building 903 once used as a waste disposal area, are both between Plate Street and Least Tern Lane.

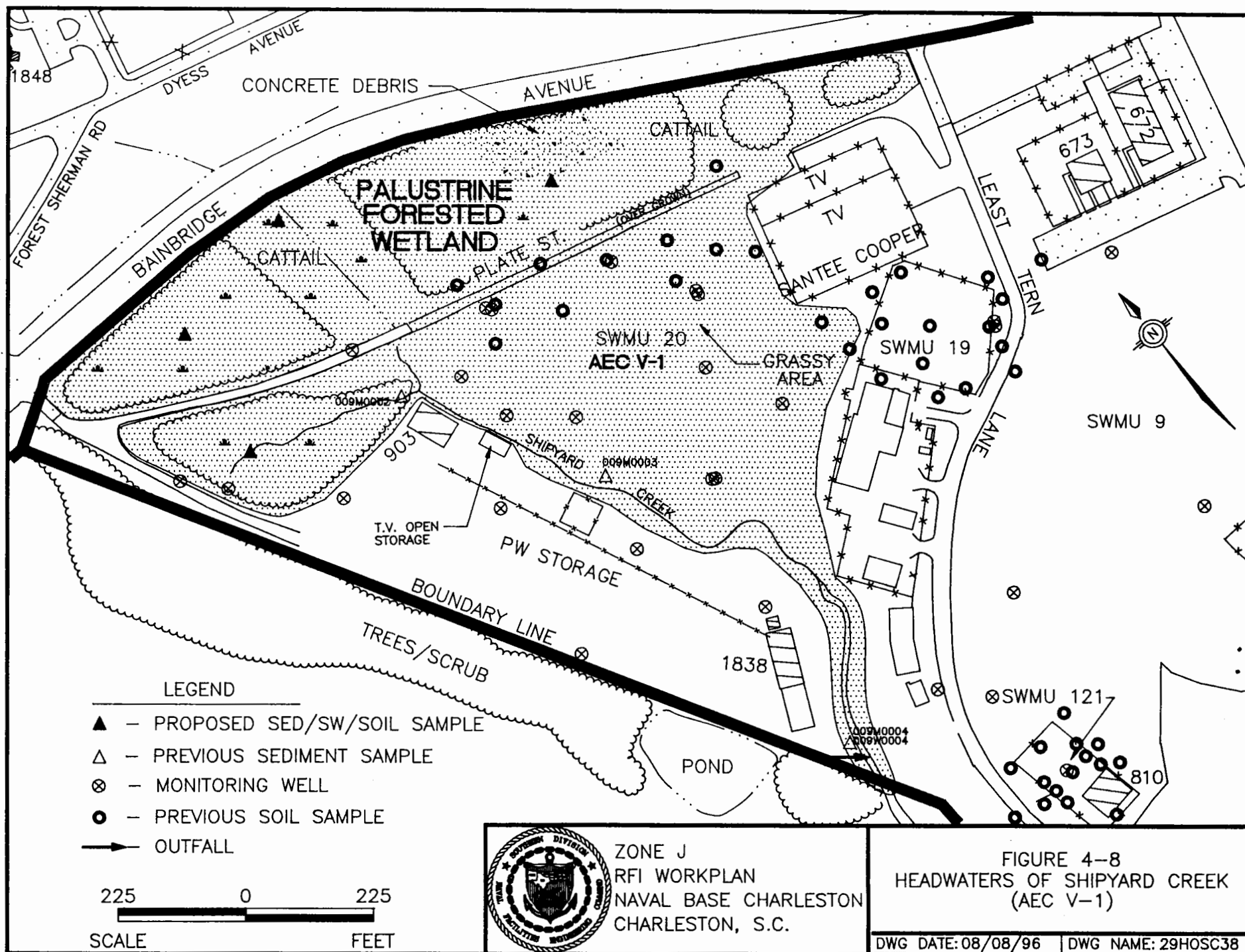
AEC V-2 includes the expansive estuarine intertidal wetland southwest of the athletic fields and the equally large palustrine forested wetland south of Building 655. The palustrine forested wetland is amidst a large wooded tract which constitutes the largest contiguous undeveloped area at NAVBASE (Figure 4-9). A posted wading-bird nesting sanctuary is southeast of the athletic fields in AEC V-2. This protected area was established after the damage caused by Hurricane Hugo in 1989, which demolished most of the mature trees and snags at the former nesting site approximately 1,000 feet to the southeast. The intertidal wetland immediately east of West Road is a salt marsh with irregular topography which allows for areas of nonhydrophytic vegetation. The unimproved West Road separates this wetland from the fringe wetlands of Shipyard Creek, yet culverts beneath the road allow tidal influence to extend inland.

Numerous AOC/SWMU sites are in or near AEC V-2. Most of AEC V-2 and the athletic fields to the east were formerly used as a landfill and have therefore been designated as SWMU 9. Three AOCs also are in the grassy area northeast of the running track (Facility 1847); AOCs 649 through 651 are each former storage areas for various industrial subcontractors. A former satellite accumulation area near Building 810 has been designated as SWMU 121. AOC 648, a transformer vault, is west of Building 673. AOC 654, an abandoned septic tank and drain field, is west of Building 661. AOC 503, a UXO site where two depth bombs were jettisoned in 1943, is north of an unimproved access road between West Road and Building 655. A satellite accumulation area at Building 665 has been designated as SWMU 159. These sites

were investigated under the Zone H RFI and their associated risk potentials are presented in the *Zone H RFI Report*.

The remainder of ESA V (AEC V-3; Figure 4-10) primarily consists of a designated dredge materials area (DMA), which received dredged sediments from both the Cooper River and Shipyard Creek. This approximately 75-acre area is surrounded by a 15- to 20-foot dike with two spillways positioned along the south and west perimeter to allow sediment dewatering. The northeastern portion of the DMA has been cross-diked and completely filled, making this area the highest topographic elevation at NAVBASE. Upland habitats on this filled area east of the DMA include tall grasses, scrub-shrub, and, in the areas which have been long since undisturbed, stands of small trees. Deer tracks (*Odocoileus virginianus*) were present along the dike-top road and a deer carcass was seen in the fringe wetland along the NAVBASE shore near the mouth of Shipyard Creek.

Eight AOCs and four SWMUs are within AEC V-3. Buildings 1887 and 1888 and the surrounding open areas are associated with former firing ranges and have been designated as AOCs 669, 670, and 684. AOC 685 is a former smoke drum at the corner of Juneau and Partridge avenues. AOCs 686, 687, and 688 are ammunition storage facilities on the east side of Juneau Avenue. The parking lot at the southern tip of the base has been designated as AOC 689 for past landfill activities. AOC 690 includes portions of roadways at the southern end of the base which are suspected sites of unauthorized dumping. SWMU 12 is a former fire fighter training area between the DMA and West Road. SWMU 14, an approximately 5-acre grassy field 100 feet east of Building 677, is an abandoned subsurface chemical disposal area. SWMU 15 is a former incinerator south of Building 1843 and SWMU 16 is the grass-covered roof of Bunker X-55 where paint was reportedly stored. These sites have been investigated during the Zones H and I RFIs, and their risk potentials will be presented in the appropriate RFI report.

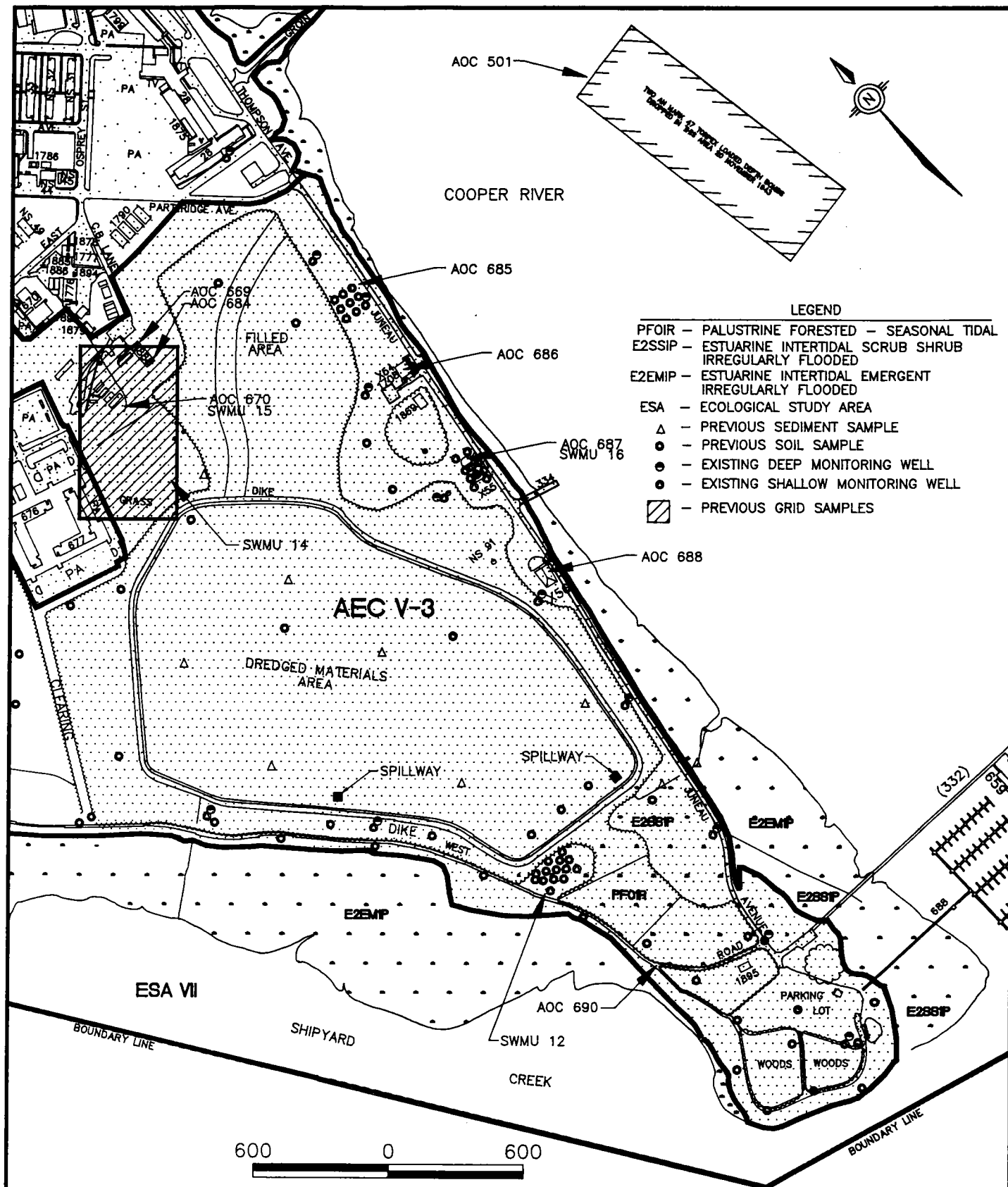


Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.



ZONE J
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4-10
DREDGE MATERIALS AREA
AND SURROUNDINGS
(AEC V-3)

DWG DATE: 08/08/96 DWG NAME: 29DMAS10

Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

Previous Investigations

ESA V includes portions of both RFI Zones H and I, the first zones designated for field investigations. Fieldwork has been completed for both zones and analytical data have been collected from all AOC/SWMU sites. Preliminary review of these data has identified several COPCs which may impact the AECs within ESA V. Analytical data from sediment samples collected from the headwaters of Shipyard Creek and the intertidal wetland between West Road and the athletic field (AECs V-1 and V-2) are incorporated into the Zone H risk assessment and presented in the Zone H RFI Report. Contaminant concentrations in the sediment samples exceeded the effect and/or screening values set by the USEPA Region IV *Waste Management Division Sediment Screen Values for Hazardous Waste*. These values are presented in Table 4-2. Zone H sediment sample locations are shown on Figures 4-8, 4-9, and 4-10.

Surface water samples were also collected at four of the sampling locations in Zone H (009W0001 and 009W0004 in AEC V-1, and 009W0012 and 009W0015 in AEC V-2). Analysis of these water samples also indicated elevated concentrations of metals. These data, presented in the *Zone H RFI Report*, will be carefully considered during the investigation of Zone J water bodies.

Phase I Conclusions

AEC V-1

The headwater region of Shipyard Creek is designated AEC V-1 for its riparian, wetland, and open field habitats. This area is bounded on the north and east by Bainbridge Avenue and on the west by an open storage facility used by Public Works Department. A Santee-Cooper transformer station and SWMU 19, a solid waste transfer station, are along Least Tern Lane to the south. SWMU 20, the open field once used as a disposal area, is in the center of the AEC. A culvert which drains surface water runoff from areas east of Bainbridge Avenue runs west beneath the road and into AEC V-1, creating a forested/scrub-shrub wetland. This wetland

Table 4-2
Maximum Concentrations Detected in Sediments
in ESA V/Zone H

Parameter	AEC V-1	AEC V-2	Effects Level/Screening Value ^a
Inorganics (mg/kg)			
Antimony	2.7	6.9	2/12
Arsenic	15.6	19.6	7.24
Cadmium	0.64	1.7	0.676/1.0
Chromium	291	59.7	52.3
Copper	228	53.7	18.7
Lead	107	92.2	30.2
Mercury	0.69	0.26	0.13
Nickel	37.3	24.6	15.9
Zinc	387	147	124
Organics (µg/kg)			
Acenaphthene	—	230	6.71/330
Chlordane	—	17	0.5/1.7
DDT	140	29	1.58/3.3
Fluoranthene	9,500	120	113/330
Phenanthrene	—	150	86.7/330
Pyrene	6,400	110	153/330

Notes:

a = USEPA Region IV (1995b) Draft Sediment Screening Values (SSVs).
 mg/kg = milligrams per kilogram
 µg/kg = micrograms per kilogram

extends approximately 1,500 feet southeast along the low-lying area between Bainbridge Avenue and the now overgrown Plate Street. Concrete and asphalt debris were in the roadside portions of the wetland. The northern portion of AEC V-1 west of Plate Street receives discharge from

another watershed area of Shipyard Creek. A culvert in the western portion of the AEC runs from the expansive offsite palustrine emergent wetland, beneath the access road to the public works storage yard and into AEC V-1. The two smaller watersheds converge immediately north of Building 903 to form a larger creek which meanders southward until going off the base near Building 1838. In this headwater portion, the creek banks are high and steep. Surface water runoff is readily apparent at several deeply eroded locations on the west side of the bank south of Building 1838.

Vegetation in the riparian areas of AEC V-1 includes southern hackberry, wax myrtle, black willow, popcorn, red mulberry, and eastern red cedar with honeysuckle (*Lonerica japonica*) and pepper-vine (*Ampelopsis arborea*) in the understory. Wetland portions of the AEC support populations of cattail, needlerush, and cordgrass. The shallows of these headwaters also have communities of small fish, fiddler crabs, and sand crabs and are therefore popular feeding areas for heron, egrets, and kingfishers (*Megaceryle alcyon*).

Sampling Plan — E/A&H has already conducted extensive sampling in AEC V-1 as part of the Zone H RFI. As discussed above, one surface water and three sediment samples were collected during the RFI of SWMU 9 (see Figure 4-8) and numerous soil samples have been collected throughout SWMUs 19, 20, and 121. The previous Zone H and Zone I samples were not specifically designed to assess ecological risk. They have, however, provided valuable information for the Zone J Phase II contaminant assessment of AEC V-1.

Based on the results of these Zone H screening samples, four additional Zone J sediment samples are proposed to assess migration pathways into AEC V-1; two in the upgradient reaches of the drainage ways entering the AEC and two in the roadside palustrine-forested wetland along Bainbridge Avenue. The Zone G RFI of AEC IV-1 will also provide valuable information regarding impacts to this downgradient AEC.

AEC V-2

As described above, this undeveloped central portion of ESA V has several different types of habitat, including an intertidal wetland, a forested wetland, and an upland forest. The intertidal wetland, once an antennae field, receives regular tidal inundation via a culvert and, during exceptionally high tides, flooding over West Road. Distinct channelization is present along the inland side of West Road, aiding the drainage of receding tidal waters. The wetland is bounded on the north and northeast by a slightly elevated band of deciduous forest. The southeastern portion of AEC V-2 supports a second, more expansive upland forest which abuts several parking lots and buildings to the northeast and a clearing which marks the AEC's southern perimeter. The woods between Holland Street and West Road have a slightly lower topography, allowing standing water and hydrophytic vegetation throughout. Debris and litter were present in varying degrees at most areas of AEC V-2, especially around the athletic fields and parking areas. Stains were also observed in a small ditch west of Building 665 and in a catch basin north of Building 665, both near SMWU 159.

The diverse habitats in this AEC host various types of vegetation. Typical estuarine vegetation such as cattail, cordgrass, and needlerush is present in the central portions of the intertidal wetland and wax myrtle, french tamarisk, and black willow are common along the wetland's fringe. The forested portions of the AEC are dominated by several overstory species such as tall oaks, southern hackberry, and mulberry, with loblolly pine (*Pinus taeda*), tree-of-heaven (*Ailanthus altissima*), and eastern red cedar tree present in fewer numbers. Common understory species are privet, possumhaw viburnum, saw palmetto, honeysuckle, and Virginia creeper (*Parthenocissus quinquefolia*).

These habitats host a wide variety of wildlife and offer a large area of suitable nesting and foraging habitats. Passerine birds include cardinal, cedar waxwing, loggerhead shrike, brown thrasher (*Toxostoma rufum*), mockingbird, and mourning dove. Red-tailed hawk, killdeer (*Charadrius vociferus*), egrets, and heron were also observed. Nest boxes had been mounted

on the fenceposts along the north end of West Road but were in poor condition and unoccupied. Fiddler crabs are abundant in the mud flat areas in the intertidal wetland and regularly flooded creek banks. Numerous small fish were in the ditch near the culvert leading from Shipyard Creek to the intertidal wetland. Numerous raccoon tracks were also present throughout.

Sampling Plan — AEC V-2 is also included in Zone H and, as a result, has undergone a significant degree of contaminant assessment. Within the intertidal wetland, one surface water and nine sediment samples have been collected. Other sediment and surface water samples were collected in the forested wetland immediately east of Building 661 (see Table 4-2 for a summary of analytical results). Numerous soil samples have also been collected in association with AOCs 503, 649, 650, 651, and 654 and SWMUs 9, 121, and 159 and along West Road (refer to Figure 4-9). The previous Zone H samples were not specifically designed to assess ecological risk to AEC V-2. They do, however, provide valuable information for a large portion of the Zone J Phase II contaminant assessment. Currently, no additional sampling is proposed at part of the Zone J RFI.

AEC V-3

AEC V-3 is the largest area of ecological concern at NAVBASE, with balanced coverage by both woodland and wetland habitat with several areas with open field. Dominating the center of the AEC is the DMA which, due to the periodic flooding and dewatering associated with dredging activities, is continually repopulated by early successional, opportunistic plant species. During the April 1995 PSA, most of the vegetation within the DMA was either dormant or dead likely due to previous inundation. Bordering the diked area to the north, east, and west is a narrow to medium band of deciduous woodlands. Woodlands are also present at the southernmost tip of the peninsula. The area between the woodlands contains both a tidal palustrine forested and intertidal wetlands, similar to those within AEC V-2.

A long, narrow open field runs west of and parallel to the northern end of Juneau Avenue. This field is transected by several ditches, overgrown with cattail, which drain runoff from the northern filled portion of the DMA to the Cooper River. The open field extends southward, behind Buildings X-44 and X-55 where it widens into an abandoned athletic field and obstacle course. The inland side of Juneau Avenue then becomes lined with the woods surrounding the diked area and continues south to the estuarine wetland. Northwest of the DMA is a maintained 3-acre lawn (SWMU 14) which NAVBASE personnel occasionally use for recreational activities.

Two unimproved roads lead to the filled portion of the DMA. One, still in use, is west off of Juneau Avenue near AOC 685 and provides access over the filled area to the dike-top road. A second dirt road had been created from C.B. Lane near the tennis courts (Building 1790), but has since been barricaded with a large fallen tree and is becoming overgrown. Access to the southern portion of the dike-top road can also be made via West Road through a clearing at the southwestern spillway.

Woodland vegetation at AEC V-3 is similar to that found in the nearby AECs, with a thick overstory of southern hackberry, mulberry, and tallowtrees with a few chokecherry, black willow, and cedar trees scattered throughout. The understory is dominated by wax myrtle, possumhaw viburnum, and saplings of the dominant trees. Although once found in this disturbed area during past ecological investigations, sea purslane, a state species of concern, was not observed during the PSA for AEC V-3. Numerous fallen trees and snags are present throughout the AEC, likely a result of past storms. The estuarine wetland between the DMA and West Road is dominated by cattail, needlerush, and cordgrass, with a fringe of french tamarisk, hackberry, and wax myrtle.

Varied wildlife is present in AEC V-3, especially within the DMA. Waterfowl species were observed in and around the drainage ways, including teal (*Anas sp.*), mallard (*Anas platyrhynchos*), sanderling (*Calidris alba*), black-crowned night heron (*Nycticorax*

nycticorax), green-backed heron, and snowy egret, likely feeding on the abundant insect larvae and small fish present in the shallow waters and channelways. Osprey, loggerhead shrike, cedar waxwing, boat-tailed grackle, mockingbird, robin, and starlings were seen in the wooded portions of the AEC. Tracks of deer and raccoon were also present in the muddy shoreline and along the dike-top road.

Sampling Plan — AEC V-3 is entirely within Zones H and I. As a result, analytical data from numerous Zone H and I AOC/SWMU sampling points throughout AEC V-3 have been obtained. Analytical data generated during these RFIs will be incorporated into the Zone J RFI. Currently, no additional Zone J sampling is proposed for AEC V-3.

The widespread distribution of Zone H and I sites covers an area from AOC 685 at the northern end of Juneau Avenue to AOC 690, the southernmost peninsular roadways. Samples have also been collected from within the DMA and in the western grassy field once used as a subsurface chemical disposal area (SWMU 14). These previous sampling locations provide both significant coverage and a preliminary characterization of environmental impact to AEC V-3. The results of these pertinent investigations will be presented in the appropriate RFI reports and carefully considered during the assessment of the Zone J water bodies.

4.2.6 ESA VI — Cooper River and Associated Wetlands

The Cooper River flows south past NAVBASE and ultimately empties into the Charleston Harbor. The tidal saltwaters in the Cooper River (SCDHEC Class SB) are suitable for secondary contact recreation (boating), crabbing, fishing, (except harvesting clams, mussels, or oysters for market purposes or human consumption), and the survival and propagation of a balanced indigenous aquatic community of marine flora and fauna (FEIS 1995).

Bordering the less industrialized northern and southern portions of NAVBASE (ESAs I, II, and V/Zones A, B, and I) are several areas of fringe wetland and salt marsh. These sensitive

wetland areas, which range from narrow to expansive, are remnants of the past marshland which once occupied the entire NAVBASE peninsula. Riprap used to control erosion along the nonindustrialized portions of the NAVBASE shoreline is interspersed with a variety of solid waste, primarily concrete construction debris.

The primary ecological risk from NAVBASE to the Cooper River is the discharge of storm water (refer to Figure 1-2) and past discharges of industrial wastewater. Discharge of contaminated groundwater is also a potential contributing risk factor and will be assessed through interpretation of analytical data from samples collected from the numerous nearshore groundwater monitoring wells and perimeter well pairs.

The multiple permitted storm water discharges into the Cooper River fall under NPDES jurisdiction and are permitted to convey only storm water runoff offsite from various facilities onsite and designates limits to only TOC, temperature, oil, and grease. Approximately 80% of storm water at NAVBASE discharges directly into the Cooper River. The remaining storm water is conveyed to Noisette or Shipyard creeks.

Most of the industrial discharges originating on NAVBASE were redirected to a municipal wastewater treatment plant in the early 1970s. These discharges to the treatment plant have also been properly permitted and have limits on pH, biochemical oxygen demand, total organic carbon, total suspended solids, and nitrate. Of primary ecological concern is discharge from the heavily industrialized Charleston Naval Shipyard (CNSY), which has replaced most of the base's natural river shoreline. At the CNSY, ship building and maintenance activities have been conducted on the Cooper River since the early 1900s. As a result of such long-term industrial activities, numerous AOCs and SWMUs are present at the CNSY. Such nearshore and land-based AOCs/SWMUs will be assessed during the appropriate zone-specific investigation, primarily Zone E, and any applicable data generated from such investigations will be incorporated in the work planned for the Zone J assessment of the Cooper River.

Although the potential exists for several industrial sources to discharge wastewater into the Cooper River, no studies conducted at NAVBASE have confirmed this possibility. Due to the antiquity of the sewer system, however, the possibility does exist (FEIS 1995). Nonidentified industrial sources may also be diverted into the storm water system, rather than being discharged to wastewater treatment facilities. The NAVBASE sewer system, including the outfalls into the Cooper River, will be investigated in the Zone L RFI.

According to NAVBASE drainage maps, 13 identified storm water outfalls discharge into the fringe wetlands along the Cooper River shoreline north of the shipyard and 18 outfalls discharge into wetlands along the southern shoreline (see Figure 1-2). Other permitted outfalls to the Cooper River include the drainage ditch from the dewatering spillway within the DMA and surface water runoff from the marina parking area. Most runoff from this area is directed to a small bermed catch basin in the southeast corner of the lot where the water is collected and then drained directly into the Cooper River and surrounding wetland.

Also significant to the assessment of the Cooper River are the continuing dredging activities. The USACOE maintains a navigational channel approximately 42 feet deep and 600 feet wide along the Cooper River to allow large naval ships, submarines, and commercial vessels to navigate along the Cooper River. In addition, the sediments around most of the 26 Navy docks on NAVBASE were routinely dredged to maintain a depth of 30 to 35 feet, although with the recent closure of the base, this practice reportedly has been discontinued.

According to USACOE, the most recent dredging of the main channel of the Cooper River along the entire NAVBASE waterfront occurred in 1991. USACOE records show the dredging started at the southern boundary of the CNSY and continued north past the northern shipyard boundary. In 1992, one small segment of the main channel was re-dredged, starting at the mouth of Noisette Creek south to Drydock 1. During both events, the dredged materials were discharged onto Clouter Island. In 1994, the USACOE collected 11 predredging sediment elutriate samples

from the Cooper River and compared the total modified elutriate results to 1987 USEPA Water Quality Criteria (WQC) for Chemicals of Concern in Marine Waters. Sample concentrations from the four locations near NAVBASE (CH-7, CH-8, CH-9, and CH-10) were reported to be either below acute concentrations or were not detected. However, the laboratory's detection limit for several metals (copper, nickel, and silver), pesticides, (chlordane, endosulfan, and toxaphene), and the PAH fluoranthene were above the WQC, therefore some exceedances of these criteria may not have been detected.

In 1995, 17 predredging sediment samples were collected from the Charleston Harbor by the USACOE. The draft results from the three 1995 samples (CH-2, CH-3, and CH-4) near NAVBASE are presented in Table 4-3 and on Figure 4-11.

The last dredging events around the piers and docks of the Naval Shipyard were conducted from December 1993 to December 1994 by private dredging companies for the Navy. According to NAVBASE Public Works, all dredged materials were discharged onto Clouter Island and no analytical samples were collected.

Preliminary evaluation of Cooper River dredging activities indicates that mapping of sediment TOC and grain size may not accurately define those areas where NAVBASE contaminants may have historically accumulated and would be of limited use in scoping and sampling activities. Considering the dredging and natural redistribution of sediments along the main channel of the Cooper River and near the shipyard piers, physical substrate information obtained would be obsolete upon any redredging or passage of a significant period of time. This information would then be of limited use as a decision-making tool during a CMS or remedial action. Instead, TOC and grain size analyses will be included with the analytical suite of parameters proposed for each sampling location to better assess the potential impacts to the water body.

Table 4-3
 Cooper River
 USACOE Pre-dredge Sediment Sampling
 Draft Results, 1995

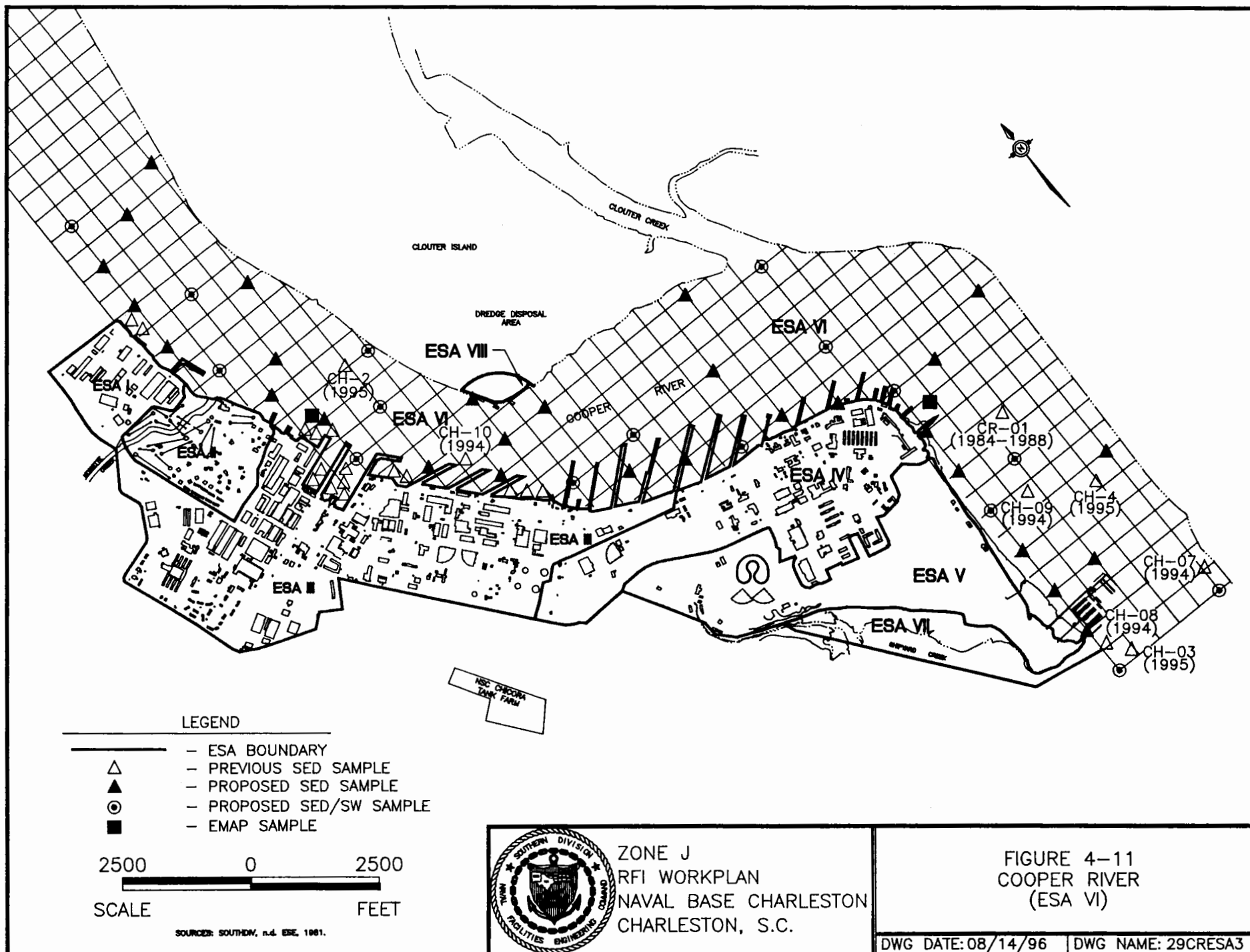
Parameter	Sampling Locations			Achieved Detection Limit	Sediment Screening Value ^a
	CH-2	CH-3	CH-4		
Inorganics (mg/kg — dry)					
Arsenic	7.4	15	19.9	0.59	7.24
Beryllium	0.919J	1.25	2.67	2.53	NA
Cadmium	0.072	0.54	0.22	0.01	1
Chromium	44.6	61.5	103	2.35	52.3
Copper	6.88	14.8	33.6	4.85	18.7
Mercury	0.014	0.050	0.180	0.012	0.13
Silver	0.127 J	0.26 U	0.125 J	0.26	2
Total Cyanide	0.08 U	0.16	3.40	0.062 to 0.15	NA
N-Ammonia	160.0	97.0	540.0	0.14 to 0.30	NA
Sulfide	0.39 U	200.00	1100.00	0.34 to 8.9	NA
Total Organic Carbon	NA	NA	0.036	0.0002	NA
Organics (µg/kg — dry)					
Naphthalene	6.03 B	22.10 B	28.90	2.36	330
Acenaphthylene	2.59 B	8.05 B	20.10	2.13	330
Acenaphthene	2.13 U	14.10	23.20	1.41	330
Fluorene	4.23 U	16.30	23.10	3.06	330
Phenanthrene	5.0 U	36.30	68.00	4.27	330
Anthracene	6.08	27.50	40.20	4.56	330
Fluoranthene	7.01 B	166.00	331.00	1.67	330
Pyrene	4.34	316.00	251.00	1.49	330
Benzo(a)anthracene	4.27	80.90	146.00	0.91	330
Chrysene	0.93 U	77.20	154.00	1.37	330
Benzo(b)fluoranthene	4.76	79.70	140.00	1.60	330

Table 4-3
 Cooper River
 USACOE Pre-dredge Sediment Sampling
 Draft Results, 1995

Parameter	Sampling Locations			Achieved Detection Limit	Sediment Screening Value ^a
	CH-2	CH-3	CH-4		
Organics (ug/kg — dry) cont'd.					
Benzo(k)fluoranthene	2.97 U	26.90	51.50	2.32	330
Benzo(a)pyrene	2.31 U	48.40	80.90	2.08	330
Indeno(1,2,3-cd)perylene	2.85 B	33.50	61.80	1.16	330
Dibenzo(a,h)anthracene	1.34 U	10.90	16.00	1.24	330
Benzo(g,h,i)perylene	7.40	3.10	41.40	1.16	330
Total LMW PAHs	8.62	124.35	203.50	—	330
Total HMW PAHs	26.33	880.9	1284.9	—	655
Total PAHs	34.95	1005.25	1488.40	—	1684
Dieldrin	0.21 U	1.36	0.30 U	0.396	3.3
4,4'-DDD	0.26 U	4.11	0.38 U	0.500	3.3
4,4'-DDT	0.74 U	1.82	1.06 U	1.41	3.3
Tributyltin	0.84 B	2.31 B	1.01 B	0.48	NA
Dibutyltin	0.56 U	26.0	0.90	0.56	NA
Monobutyltin	1.82 U	8.55	7.84	1.82	NA

Notes:

- a = Sediment Screening Value, Region 4 Waste Management Division, Nov. 1995
- bold** = denotes concentration exceeding Sediment Screening Value
- U = Not detected at or above detection limit.
- B = Analyte detected in sample is < 5 times blank value.
- NA = Value Not Available
- = Not Applicable
- LMW = Low Molecular Weight
- HMW = High Molecular Weight
- µg/kg = micrograms per kilogram



Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

Offshore AOCs

As part of the Zone J investigation of the Cooper River, the following offshore AOCs will also be assessed: AOC 500, UXO between Piers S and T; AOC 501, a UXO site off the southern end of base; and AOC 502, a third UXO site near Pier G (refer to Figure 1-2). Section 5.5 addresses the investigatory approach proposed for these Zone J UXO sites.

The two remaining open-water AOCs in Zone J (AOC 691, the waterfront, and AOC 692, free oil from areas along the Cooper River) will be addressed during the overall ESA VI assessment described below in the sampling plan for the Cooper River. Both site specific and grid-based soil and groundwater sampling proposed in the nearshore RFI zones will also contribute valuable source/contaminant data for the Zone J risk assessment of the Cooper River.

Previous Investigations

Most of the Cooper River studies which involve the assessment of hydrology and water and sediment quality have encompassed the entire Charleston Harbor System or the even larger Carolinian Province with limited focus on the water bodies near NAVBASE. Information is therefore limited primarily to the few isolated stations near NAVBASE and to that which can be assimilated from overall system conditions. The following section summarizes the data obtained from several such studies.

A Physical and Ecological Characterization of the Charleston Harbor Estuarine System

This 1990 study, commonly known as the Charleston Harbor Study (CHS), is a review of numerous pertinent studies and a collection of long-term trend data. This report was submitted to the South Carolina Coastal Council to characterize hydrographic conditions and selected biological communities in the estuarine portions of the Cooper, Wando, and Ashley rivers, and the Charleston Harbor basin following a redirection project in the upper portion of the watershed. The report included data related to risk determination such as water quality,

sediment distribution, benthic macroinfaunal communities, finfish/invertebrate communities, and contaminant concentrations and distributions.

Sediments — During the long-term study, sediments observed at Station CR01, in the center of the Cooper River by ESA V (see Figure 4-11), had the highest percentage of fine material found within the targeted river areas, although it fluctuated substantially throughout the study. CR01 sediments were made up primarily of silt and clay but percentages change erratically from one sampling effort to the next.

In the intensive short-term study, a wide diversity of sediment types was observed in the Cooper River next to NAVBASE. No specific trend in sediment particle size was obvious from the data. It was noted that in regions where hydrographic energy was obstructed by piers and docking facilities, such as the Navy Base, Naval Shipyard, and industrial centers, the greatest concentrations of fine-grained materials were found. Sediments near the Naval complex were described as unconsolidated material. However, sand dominated sediments along the east bank of the Cooper River across from the Naval Shipyard.

Benthic Macrofaunal Communities — The long-term seasonal investigation of benthic macrofaunal communities within the Cooper River indicated that, relative to other stations, species diversity and richness were highest at CR01. It was concluded that salinity is the most important determinant of benthic community structure, with sediment type playing a secondary, more site-specific role.

The short-term, spatially intensive study of benthic macrofauna did not indicate any clear relationships between abundance or distribution of benthic organisms and the various human activities in the study area. However, a high abundance of species known to be pollution-tolerant or opportunistic organisms at some sites may have been a result of anthropogenic effects. No specific discussion for the area near NAVBASE was provided but generally the

Cooper River had lower diversity values than nearby rivers (Wando and Ashley). It was suggested that these lower diversity values may be a reflection of the greater number of industrial and port facilities along the Cooper River.

Finfish and Invertebrate Communities — A general summary of the impacts of the diversion project on finfish and invertebrate species is presented in the CHS. Information on distribution is limited primarily to river systems with a summary describing the changes in abundance and biomass for pre- and post-diversion periods. The information provided, as it relates to activities or impacts from NAVBASE, is at best qualitative for the purpose of risk determination. It does provide detailed information on potential receptor species within the study area and thus will be used accordingly.

Information on larval fish and invertebrates is similar to that for larger individuals except that fewer stations were sampled. Specifically, no stations were within the Cooper River and therefore information concerning larval distributions within that portion of the river near the naval complex can only be extrapolated using correlative water quality information.

Contaminants — During the two-year study, both metals and organics were measured in sediment and tissue (several species). During the intensive study, only sediment metals were measured. Due to the transient nature of most of the selected tissue species (except oysters) and the fact that the Naval complex is not necessarily the sole contributor of contaminants in the area, correlation between existing tissue information has been given limited consideration in this overview.

In the sample station near the Naval complex (CR01), the only metal constituents detected in sediment during the two-year study were mercury (22.4 $\mu\text{g/kg}$), chromium (36.5 mg/kg) and copper (19.4 mg/kg). According to the report, no organics were found at CR01 during the two-year study.

During the intensive study, chromium and copper were detected at all the Cooper River stations. Chromium concentrations varied, but in general, lower values were observed in the center of the channel with higher concentrations found toward the banks. Copper concentrations in the Cooper River were lower than both stations in Shipyard Creek, which exceeded 20 mg/kg.

Five estuarine species were collected from CR01 for contaminants analyses: blue crabs, white shrimp, spot, southern flounder (*Paralichthys lethostigma*) and American oyster (*Crassostrea virginica*). Table 4-4 presents the sediment and tissue contaminant concentrations detected during both the 1987 and 1988 sampling events.

Table 4-4
 Sediment and Tissue Concentrations from Station CR01
 Two-Year Study — 1987 and 1988

Parameter	Sediment (1987/1988)	Tissue (1987/1988)				
		Spot	Flounder	Crab	Shrimp	Oyster
Inorganics (mg/kg)						
Cadmium	—	—	— /ND	—	—	2.51/—
Chromium	11.2/36.5	—	—	—	—	—
Copper	— /19.4	18.6/—	18.9/—	81.2/44.5	78.3/64.5	179.9/197.3
Mercury (µg/kg)	13.1/22.4	— /5.0	—	16.6/9.8	—	—
Organics (µg/kg)						
Benzoic Acid	ND	—	—	— /LE	—	— /382
Chloroform	ND	— /63.9	— /28.1	— /LE	—	—
Hexachlorobutadiene	ND	—	—	293/LE	—	NSC/—
PCBs	ND	129/—	ND/60	— /LE	28/—	NSC/—
Toluene	ND	— /20	—	— /LE	— /22.7	—

Notes:

- = No results reported
- ND = Not Detected
- NSC = No Sample Collected
- LE = Laboratory Error due to instrument failure, insufficient sample to repeat

Final EIS — Charleston Naval Base

Information on terrestrial and aquatic environments occurring on or near NAVBASE were assessed in a recent environmental impact statement (E&E 1995). General descriptions of vegetation and wildlife species found across the base were presented. In addition, information on threatened and endangered species in the vicinity of the base was also discussed.

Habitats — Intertidal wetlands are found on the margins of the Cooper River and Shipyard and Noisette creeks. Habitat types such as mud flats, *Spartina* marshes, and cattail marshes are found, especially at the southern end of the base. Palustrine forested wetlands were identified along Shipyard and Noisette creeks. Most of the areas were identified as having some estuarine influence. Less pervasive wetland habitats found on the base include palustrine scrub-shrub and palustrine emergent wetlands.

Fauna — Avian fauna were considered the most prevalent wildlife type present basewide, and smaller mammal species such as raccoon, opossum, and rabbit most likely to occur in undeveloped portions of the base. A variety of reptiles, amphibians, passerine bird species, and smaller raptors typical of the southeastern U.S. occur across the base. Avian species associated with aquatic environments (shorebirds) are plentiful.

Threatened and endangered species (see Table 4-1) potentially found in the area include the least tern, which have used building rooftops for colonization. Wading bird colonies, including species such as herons and egrets, have been found in isolated areas of the base.

Special status marine species likely to occur in local waters include the loggerhead turtle, Kemp's Ridley sea turtle, West Indian manatee, and the shortnose sturgeon.

Personal Communications

On November 4, 1994, Dr. Thomas D. Mathews of MRRI was contacted concerning specific portions of the CHS with which he was involved. Dr. Mathews indicated that, to his knowledge, the contaminant information provided by the CHS was likely the most current and comprehensive data sets for that portion of the Cooper River near the Naval Base. He stated that the USACOE probably had some data concerning local dredge activities but he has found these data difficult to obtain. The presence and concentrations of organotins in sediments in that reach of the river were also discussed. Dr. Mathews' opinion was that organotin concentrations in the harbor area were most likely not injurious to biota. His opinion was based on information he had obtained from specific NOAA studies.

AEC VI Phase I Conclusions

As the largest and most complex open water site in Zone J, the PSA of the Cooper River was conducted primarily through review of documented studies. Adequate data regarding the numerous potential contaminant sources and migration pathways from NAVBASE to the Cooper River, biological receptors, and the identification of a suitable reference area have not yet been obtained.

Sampling Plan

Forty-five sediment and 16 surface water samples are tentatively proposed for the Cooper River and its associated wetlands (AEC VI) and their locations are presented in Figure 4-11. The rationale for the contamination assessment of the Cooper River is to conduct a tiered grid sampling pattern. The grid axes are set on a north-south bearing and variable densities of samples may be collected at select grid nodes. To address offshore AOCs 691 and 692 (the NAVBASE waterfront and free oil areas) and to provide a higher concentration of grid samples close to the NAVBASE shoreline, grid nodes are established on 500-foot centers. To reduce the total number of samples without limiting overall coverage, fewer samples are proposed along the dredged center of the river, where potential contaminants from NAVBASE are less likely

to remain, and even fewer along the far shore near Clouter Island. The sampling grid will extend upriver to a point beyond the influence of the tidal wedge, which may transport constituents from NAVBASE upriver during high tide. Several samples are also proposed downriver of NAVBASE to assess the reasonable extent of contamination entering the Charleston Harbor. Due to the temporal and spatial variability of the tidally influenced and mobile surface waters, several sampling events may be necessary.

It is anticipated that the Phase II Contamination Assessment of the Cooper River will be conducted after all relative zone investigations, particularly the Zone L RFI of the NAVBASE sewer systems, have provided sufficient data to guide a more effective selection of AEC VI sampling locations. As sampling is conducted within the RFI zones at both waterfront sites and perimeter well pairs, more information regarding offsite contaminant migration via surface water, groundwater, and other pathways will be available.

4.2.7 ESA VII — Shipyard Creek and Associated Wetlands

A drainage creek to the lower Cooper River, Shipyard Creek is partially included in the southwestern property boundary of NAVBASE and receives the westerly runoff from the central and southern portions of the base (Figure 4-12). The downstream portion of Shipyard Creek is considered a navigable water body, maintained to an USACOE-authorized depth of 30 feet below mean low water level to give large ships access to service piers of a ship maintenance facility on the southwestern shore. Shipyard Creek is dredged approximately once a year according to the USACOE and the last known dredging event took place in 1994. All USACOE dredge spoils were reportedly discharged onto Daniel Island, a designated upland DMA (non-Navy property).

The NAVBASE shoreline hosts numerous wetlands including estuarine intertidal emergent, estuarine intertidal unconsolidated shore, and estuarine subtidal unconsolidated bottom. A

significant wetland community also exists in the intertidal emergent zone along Shipyard Creek. Vegetation in this wetland zone is typical for the area and consists primarily of *Spartina* spp.

Potential impacts to this water body include the upstream and nearshore SWMUs and AOCs in ESA V, particularly SWMUs 9, 12, and 20 and AOCs 689 and 690. The periodic dredging of sediment in this creek likely affects communities of benthic organisms. One of the two dewatering outfalls from the dredge materials area discharge into the emergent wetlands along Shipyard Creek.

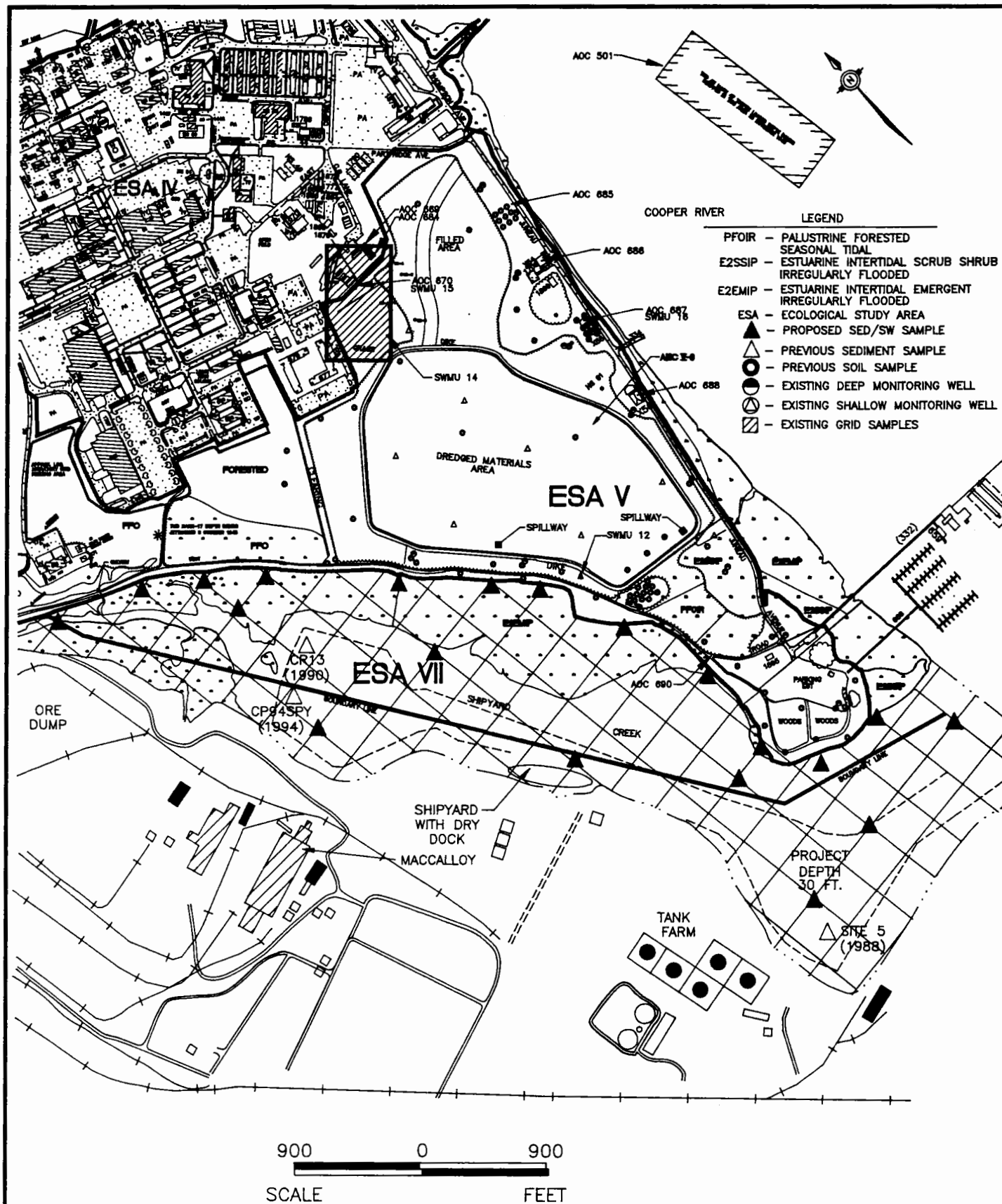
Consideration will also be given to potential offsite impacts to Shipyard Creek, which include upstream discharges from a ferrochromium plant operating since the 1940s. The offsite facility is also undergoing a state-required contamination assessment. A commercial shipyard and tank farm also are on the creek's western shore.

Previous Investigations

EPA Dredged Sediment Assessment

In August 1988, a final report on an assessment of sediments from five proposed dredge locations in the Charleston Estuary was submitted by USEPA to the USACOE. In this report, titled *Biological and Chemical Assessment of Sediments from Proposed Dredge Sites in Charleston Harbor, 1988*, toxicological effects to marine organisms by sediments from proposed dredge locations were presented. For the purposes of this review, only Site 5 (in Shipyard Creek) data were deemed applicable.

Ten-day tests with whole sediment and 96-hour tests with the suspended particulate phase identified no effects to lugworms, oysters, shrimp, or mysids from sediment from Site 5. No significant effects were noted based on this toxicity information.



ZONE J
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4-12
SHIPYARD CREEK
AND SURROUNDINGS
(AEC VII)

DWG DATE: 08/14/96 DWG NAME: 29SCAS12

Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

Along with the toxicological study, chemical analysis of sediment and a bioaccumulation study were conducted at all locations. Concentration information of selected metals in sediment at Site 5 showed only arsenic (76 mg/kg) and zinc (68 mg/kg) to be at concentrations exceeding USEPA Region IV Sediment Screening Values (SSVs) (7.24 mg/kg and 2.0 mg/kg, respectively). Bioaccumulation information indicated that cadmium, mercury, and zinc concentrations were significantly higher in oysters at Site 5 than at the reference location. Mercury, lead, and chromium in Site 5 shrimp were also significantly higher than reference concentrations. Lugworms bioaccumulated lead in tissue above the detection limit of 0.075 µg/kg. The mean lead concentration was 1.6 µg/kg.

A Physical and Ecological Characterization of the Charleston Harbor Estuarine System

During this 1990 study, the highest chromium concentrations were detected in Shipyard Creek sediments (81.18 mg/kg at the uppermost station CR13). Copper concentrations in Shipyard Creek exceeded 20 mg/kg. Both these concentrations exceed those observed in the Cooper River.

Shipyard River New Work Project

In May 1992, the USACOE conducted a program to collect and analyze soil samples from six sites at Charleston Naval Station near Shipyard River (Creek). The purpose was to provide documentation on the suitability for disposal of this material. Specific parameters analyzed included metals (including organotins), volatile organics, and dioxins.

Results showed the presence of organotins at all six sampling locations with the lowest concentrations for tributyltin found along the shoreline and within the intertidal area and the highest concentrations in terrestrial soils. Several PAH compounds were identified at stations within the woodlands and dioxins were detected in soil/sediment from both inland and intertidal areas.

EMAP/NS&T Studies in the Carolinian Province: Indicator Testing and Evaluation in Southeastern Estuaries, May 1995.

Development studies were conducted during a pilot year program (1993) to evaluate existing Environmental Monitoring and Assessment Program (EMAP) indicators and develop new indicators of environmental quality for southeastern Atlantic estuaries. At 24 stations throughout the Carolinian Province, physicochemical parameters were measured in addition to sediment contamination, laboratory toxicity tests, bioaccumulation, and fish, shellfish, and benthos abundance. A single station was sampled in Shipyard Creek (SPY) and classified the tributary as "degraded" based on bulk sediment contamination exceedances of Long and Morgan's (1990) ER-L (effects range-low) values for several metals (33 mg/kg arsenic, 47.8 mg/kg chromium, 29.58 mg/kg copper, 20.86 mg/kg lead, 318.40 mg/kg manganese, and 72.58 mg/kg zinc) and PAH compounds (2,020 µg/kg benzo[a]pyrene, 744 µg/kg chrysene, 744 µg/kg pyrene, and 672 µg/kg benzo[k]fluoranthene). Also, significant toxicity for sediments from Shipyard Creek was found in both the seed clam toxicity test and Microtox® bioassay. Other toxicity tests with amphipods and mysid shrimp, however, indicated that Shipyard Creek sediments were not toxic to these species.

In bioaccumulation studies on oysters, chromium, zinc, copper, nickel, iron, and manganese tissue concentrations were increased after exposure to Shipyard Creek sediment. Benthic community indices for Shipyard Creek were much lower than those found in reference areas.

Year One Demonstration Project Studies Conducted in the Carolinian Province by Marine Resource Research Institute: Results and Summaries, September 1995.

Water quality parameters, sediment characteristics, sediment contaminants, sediment toxicity tests, benthic communities, and nektonic (free-swimming) assemblages were evaluated from 84 sites from Virginia to Florida by MRRI during the summer of 1994. One location in Shipyard Creek (CP94SPY) was selected as a supplemental station and sampled during the pilot year, 1994. Comprehensive sampling was not conducted at the supplemental stations, but

sediment samples were collected for contaminant analyses, characterization, and toxicity testing. Also, oysters and clams were deployed to determine bioaccumulation rates. Due to the large scale of the figure presented in the MRRI report, the sampling location on Figure 4-12 is approximate.

Relative to NOAA ER-L values, elevated concentrations of PAHs (total PAHs at 8,195.7 $\mu\text{g/kg}$ dry sediment weight), pesticides (0.12 $\mu\text{g/kg}$ dieldrin, 1.02 $\mu\text{g/kg}$ total chlordane, and 9.30 $\mu\text{g/kg}$ total DDT), and the metals arsenic (10.4 mg/kg) and chromium (1,911 mg/kg) were detected in Shipyard Creek sediments during this sampling program. Based on the classification scheme presented in the document, Shipyard Creek was designated as a degraded site.

Survival data for sediment 10-day solid-phase toxicity test, using the amphipod *Ampelisca abdita*, indicated that Shipyard Creek was not toxic. But when amphipod *A. verrilli* was used, survival was significantly lower than the control. In seed clam toxicity assays, Shipyard Creek was shown to be significantly toxic.

For both clam and oysters, growth was significantly different from control groups. As expected, based on the sediment concentrations bioaccumulation studies showed elevated concentrations of chromium (32.18 mg/kg tissue dry weight) in oysters deployed in Shipyard Creek. Clam concentrations did not reflect the sediment loads.

The Tidal Creek Project, March 1996 (Interim Report)

In 1994, the South Carolina Marine Resources Research Institute initiated a study to develop information needed to ensure that tidal creek nursery habitats were adequately protected. Twenty-four tidal creeks were sampled for numerous parameters to determine present environmental and ecological status and thus provide resource agencies with a gauge to measure their respective protection policies and programs. Two locations at Shipyard Creek, one in both the upper and lower reaches, were included in this project. The upper reach was defined as a

300-meter section beginning at the headwaters where the minimum water depth was 1 meter at mean high tide. The lower reach was the next 300 meters, making the total length of study area 600 meters.

In this report, Shipyard Creek was classified as a “developed-industrial” tidal creek system with salinities averaging 16.3 nanograms per kilogram (ng/kg) and dissolved oxygen averaging 60% saturation. Physicochemical attributes in Shipyard Creek were similar to other “developed” creeks studies.

Sediment trace metal concentrations for chromium copper, lead, arsenic, and zinc exceeded NOAA ER-L values in the upper reach of the creek, with arsenic, chromium, lead, and zinc concentrations higher than ER-L in the lower reach (refer to Table 4-5). Chromium also exceeded the effects range-median (ER-M) value (370 ppm) in both reaches of the creek. Pesticide concentrations in the creek were insignificant and PAH concentrations were not measured.

Table 4-5
Trace Metals in Shipyard Creek Sediments
1995 Tidal Creek Project

Trace Metal	Upper Reach	Lower Reach	ER-L/ER-M
Arsenic	12	17	8.2/70
Chromium	397	419	81/370
Copper	64.6	21.9	34/270
Lead	107	54.6	46.7/218
Zinc	338	197	150/410

Notes:

All units are in mg/kg

ER-L and ER-M values are derived from Long et al. 1995.

Benthic assemblage data did not identify anything unique for Shipyard Creek. Species composition and abundance were similar to the other "developed" creeks studied. Grass shrimp populations in the creek were much lower than in the other four creeks selected for comparison. No relationships for shrimp abundance to contaminant exposure, habitat availability, or water quality regimes were presented.

AEC VII Phase I Conclusions

AEC VII includes the portion of Shipyard Creek from approximately 300 feet southwest of Building 661 downstream to its confluence with the Cooper River. The PSA of Shipyard Creek was conducted from a small boat which could maneuver both within the main channel and along the shallow and narrow cuts made by various shoreline drainage features through the emergent vegetation. The bank of the creek along NAVBASE property is almost entirely obscured by the estuarine emergent wetland. A small, exposed portion of the bank near the southern peninsula has been reinforced with wooden shoring, apparently to prevent erosion. In the center of the creek several dozen evenly spaced metal poles extend several feet above the water's surface and likely denote the perimeter of an existing or proposed dredge area. Commercial dredging equipment was also staged on several barges in the center of the creek.

Obvious points of tidal conveyance to and from onshore wetlands and drainageways at NAVBASE were observed at several locations. Fewer such areas were present on the southern shore. The southern wetlands were also less widespread, due to the construction of the shipyard and industrial piers. A survey of this opposing shoreline also indicated a potential source of contamination into the creek. Near the ferrochromium plant, debris piles were at or near the water's edge, including tires, scrap metal, and several rusted drums. Several NPDES permitted discharges are also along this shoreline. It is likely that the surface water runoff associated with the debris piles and the point source discharge from the outfalls impact both the water and sediment quality of Shipyard Creek.

In addition to the cordgrass wetland within the creek, riparian vegetation was present along both shorelines, including southern hackberry, mulberry, wax myrtle, and tallowtrees. Wildlife observed in or near this aquatic AEC include numerous wading birds, including green-backed heron, snowy egret, and great blue heron. Seagulls, brown pelicans, kingfisher, and osprey were also foraging in the open waters. An active osprey nest was on the boom of the dredge crane and a pair of red-tailed hawk was also present. Boat-tailed grackle and red-wing blackbirds were foraging throughout the wetland vegetation. Small fish and turtle were seen in the open water portions and fiddler crab were abundant in the wetland mudflats during low tide.

Sampling Plan

Twenty sediment and surface water samples are tentatively proposed for Shipyard Creek. These include 12 grid-based samples throughout Shipyard Creek and its associated wetlands (AEC VII). These non-site-specific sampling locations are presented in Figure 4-12. Eight additional offshore sediment samples along the southern portion of the creek were proposed as part of the Zone I investigation of AOC 690, the southern roadsides. As critical samples measuring offsite migration and potential impact to Shipyard Creek, it was considered prudent to postpone the collection of these samples until the Zone J AEC VII investigation.

The rationale for the contamination assessment of Shipyard Creek as a whole is similar to that proposed for the Cooper River; that is, the implementation of a tiered sampling grid. As with AEC VI, the grid axes for the creek are set on a north-south bearing and variable concentrations of samples will be collected at select grid nodes. Grid nodes are established on 100-foot centers to provide a higher concentration of grid samples close to the NAVBASE shoreline. To reduce the total number of Zone J samples without limiting overall AEC coverage, few samples are proposed along the dredged center of the creek, where potential contaminants from NAVBASE are less likely to remain, and even fewer along the far shore. Sediment and surface water samples collected during the previous Zone H investigation and Zone J samples proposed during Phase II at AEC V-1 (headwaters of Shipyard Creek) will be used to characterize upstream and

headwater conditions. Several grid samples are also proposed downstream to assess the extent of contamination entering the Cooper River.

The Phase II Contamination Assessment of the lower portions of Shipyard Creek will be conducted after all relative zone investigations have provided sufficient data to guide a more effective selection of AEC VII sampling locations. The only zones that border the creek are Zones H and I, both of which are in the final stages of contaminant assessment of their associated AOCs and SWMUs. As a result, Shipyard Creek is likely to be one of the first AECs to undergo Phase II sampling. As sampling is conducted within these waterfront zones and from the perimeter well pairs, more information will be available regarding offsite contaminant migration via surface water, groundwater, and other pathways.

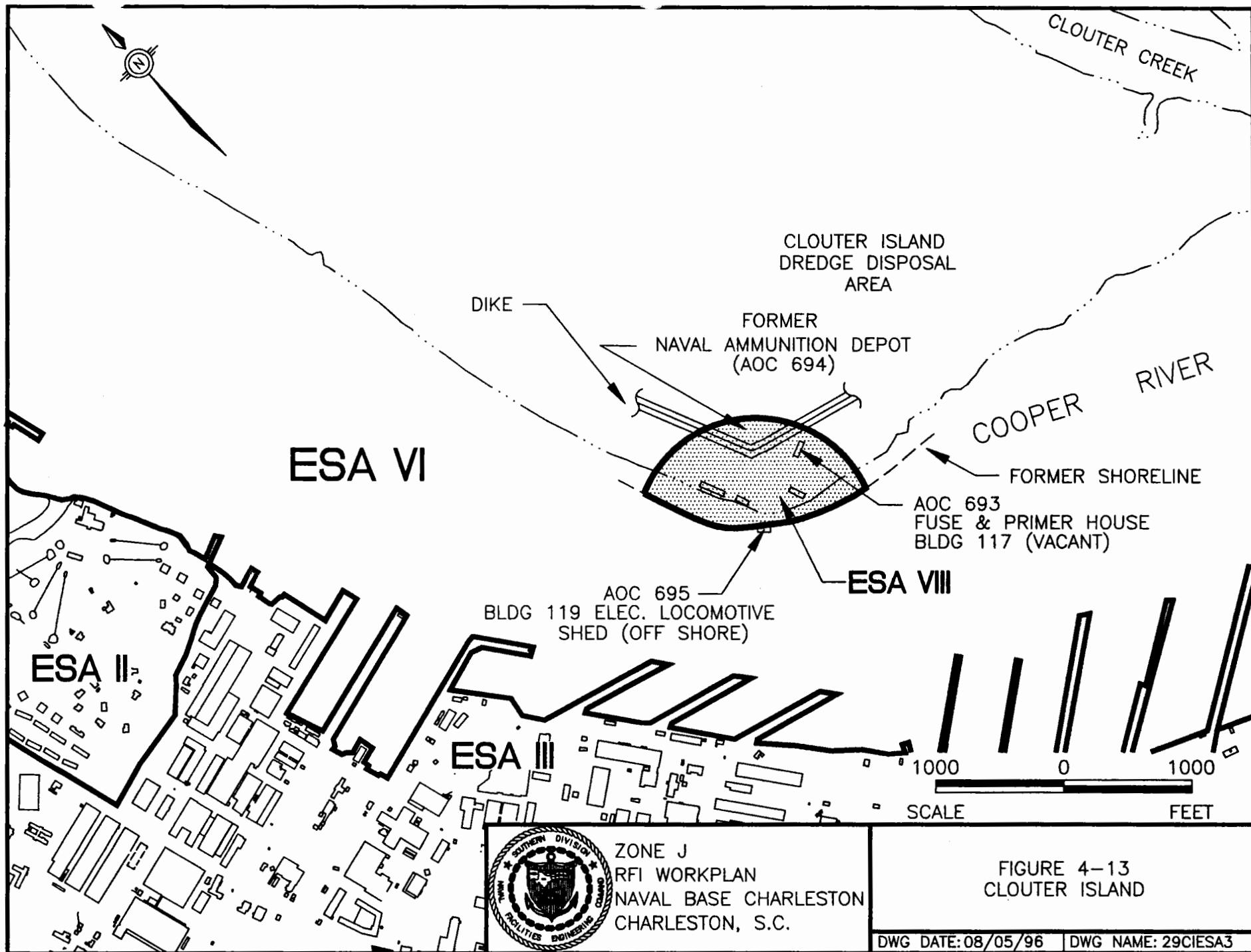
4.2.8 ESA VIII — Clouter Island AOCs

An approximately 1,400-acre portion of Clouter Island (Daniel Island/Clouter Creek Dredge Disposal Area) on the eastern side of the Cooper River directly across from NAVBASE has been reserved by the U.S. Navy for dredge deposition. The expansive and relatively uniform interior of the diked dredged material area is dominated by scrub-shrub vegetation. The Clouter Creek Disposal Area routinely received material from the maintenance dredging around the NAVBASE piers (approximately 1,226,000 cubic yards per year, FEIS 1995), although this practice has reportedly been discontinued. A pair of submerged dredge lines leads from the piers to the island and discharge dredged slurry into the large disposal cells. An onsite pump station facilitates the staging or phasing of dredge deposition by means of alternating discharge pipes placed along the island's western shoreline. Coarse sands, which tend to filter out quickly, are deposited on the west half of the island. Fine clays and silts, which predominate as dredge material from the Cooper River, tend to stay suspended longer and are therefore deposited farther away from the discharge point (to the east side of the island). With few remaining dredge deposition sites near NAVBASE, Clouter Island is considered an important resource and no alternative uses are likely to be proposed.

AEC VIII Phase I Conclusions

As a noncontiguous property, Clouter Island is the only ESA in which the scope of the ERA is limited to AOC-related habitats; therefore, a PSA of the entire island's ecology was not performed. Thus, the Zone J PSA of Clouter Island addressed only the ecological components associated with the three AOCs on the wooded southwestern portion of the island (AEC VIII; see Figure 4-13). These AOCs are all associated with the former Naval Ammunition Depot, (AOC 694/Zone K) and presently consists of one structure (Building 117), several large concrete foundations (from Buildings 102, 103, and 106), and a mound of demolition debris near Building 103, a former magazine. AOC 693, an abandoned Fuse and Primer House (Building 117), is the only structure associated with the former naval ammunition depot that remains intact. AOC 695, the former site of the Building 119 (Electric Locomotive Shed), is currently 50 feet offshore. Review of a 1939 map of the depot, this building was constructed on top of a railroad trestle which extended out from the shore apparently to allow rail access to supply and munition barges. The 1939 map shows the distance of Buildings 102 and 106 to the shoreline to be approximately 50 feet. The foundations of these buildings are now at the shoreline. The site of AOC 695 being underwater, it is uncertain if any of the structure and its associated wharf and trestle remains or if it was removed.

The ammunition depot's rail system, once servicing the entire complex, is no longer present. A portion of the railbed, however, is still evident as an unimproved shoreline road leading northward from the depot. Heavy earth-moving equipment, likely used for dike repair and maintenance, was parked on this road. Nearby, a second area was also used to stage such equipment as evidenced by two large diesel stains (soil had distinct diesel odor). A dredge line ran along side the unimproved road to the north and the base of the dike. Several truckloads of a dry, gray clay-like material, possibly dredge material from a dredge line maintenance event, have been dumped on and around the foundation of Building 102, the former Shell House, along with several discarded sections of dredge line. This foundation and the foundation of Building 106, the former Fixed Ammo Storehouse approximately 150 feet to the north, are more



Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

than 15 feet above the surface of the Cooper River. Erosion from the tides and regular flow of the river have removed a considerable portion of the shoreline between the two structures. Each naval depot site at Clouter Island will be investigated during the Zone K RFI for noncontiguous Navy properties.

Habitats associated with this area are the fringe wetlands along the shore, the scrub-shrub around the foundations of Buildings 102 and 106, and the forested bottomland where Building 117 and the remains of Building 103 are located. Typical marsh vegetation dominates the estuarine emergent wetland, including cordgrass and cattail. Wax myrtle, yaupon, and young mulberry and tallowtrees surround the foundations to the north, with several saw palmettos scattered throughout. The bottomland between the dike and the shoreline is dominated by southern hackberry. Very little undergrowth was present, due primarily to the lack of sunlight penetrating the heavy tree canopy and partially to occasional flooding. The southwestern corner of the dredge disposal area's dike is less than 100 feet north of the depot and rises approximately 25 feet above the forest floor. A cleared trail which parallels a second dredge line leads up the slope from the shore to the top of the dike.

The biota of this AEC is similar to biota of analogous wetland and woodland locations in the area such as Shipyard Creek, and may include nesting habitat for migratory and resident wading and shore birds. Wildlife on the island also includes deer, coyote (*Canis latrans*), and rabbit (*Sylvilagus sp.*), confirmed by the presence of both tracks and scat.

Sampling Plan

Sufficient data have not been obtained regarding potential contaminant sources and migration pathways from the AOCs at Clouter Island and a suitable reference area. The presence of the ammunition depot and uncertain closure activities indicate the potential presence of hazardous, ignitable, and/or explosive materials. This condition warrants the Zone J ERA of the area to proceed to Phase II Contaminant Assessment. However, no Zone J sampling will be conducted

until the Zone K RFI of the sites provides the initial AOC-specific contaminant characterization. Furthermore, it has been reported that the USACOE is considering acquiring Clouter Island for continued use as a land-based dredge spoil disposal area. Until this possible transfer is substantiated, no action by the Navy is anticipated.

5.0 HEALTH AND SAFETY PLAN

5.1 Introduction

E/A&H is conducting an environmental monitoring program at specific NAVBASE sites to assess the nature and extent of contamination at these sites and to determine if additional action is required to maintain compliance with environmental regulations.

The USEPA has grouped these sites into SWMUs and AOCs for investigative purposes. This Zone-Specific Health and Safety Plan (ZJHASP) has been developed for Zone J.

This ZJHASP was written to complement the E/A&H NAVBASE Comprehensive Health and Safety Plan (CHASP) by providing site-specific details which are absent in the CHASP. Site-specific details presented here include: potential site contaminants, proposed site activities, action levels, and initial level of personal protective equipment (PPE). Copies of both plans should be onsite during all field operations.

This plan defines "contaminants of concern" and "constituents of concern" in the following terms. Not all constituents of concern are contaminants of concern. Constituents of concern are compounds analyzed for because of public health, regulatory, ecological, or other concerns. The term "contaminant of concern" identifies (potential) site contaminants that may be present in sufficient concentrations to cause concern about potential occupational exposures to onsite personnel.

5.1.1 Applicability

The provisions of this plan are mandatory for E/A&H personnel who must read this plan and sign the plan acceptance form (see Appendix D) before starting site activities. In addition, personnel will operate in accordance with the most current requirements of Title 29 Code of Federal Regulations (CFR) Section 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). These regulations include the following provisions for employees

involved in cleanup operations covered by RCRA: training 1910.120(e), medical surveillance 1910.120(f), and PPE 1910.120(g).

All non-E/A&H personnel present in E/A&H work areas shall either adopt and abide by this ZJHASP and the corresponding CHASP or shall have their own safety plan which, at least, meets the requirements of the E/A&H CHASP and ZJHASP.

This ZJHASP applies to standard field procedures and tasks such as drilling; installing and developing monitoring wells; surveying; and collecting soil, groundwater, surface water, and sediment samples. In addition to these, standard field procedures for biota sampling may be proposed for any AEC or NAVBASE water body. Nonroutine procedures and tasks involving non-routine risks are not covered by this plan. If it is necessary to conduct these or other "high risk" tasks, specific health and safety procedures must be developed, approved, and implemented first.

5.1.2 Work Zones

Section 2.1 of the CHASP, describes the relative functions of the three work zones which make up the work area:

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ)
- Support Zone (SZ)

These work zones will be established and used during fieldwork covered under this plan.

5.1.3 Work Area Access

Authorized personnel will be allowed access to work areas if they follow the requirements of this ZJHASP and the CHASP. See also Work Area Access, Section 2.2 of the CHASP.

Authorized Personnel — Only personnel identified as necessary to the investigative operations at each work site will be considered authorized. The Navy and E/A&H will determine which personnel are necessary and authorize their access. E/A&H personnel who are to perform work in an E/A&H controlled area must have current HAZWOPER training certificates on file onsite, must be under medical surveillance, and must be equipped and be willing to don all PPE specified by the health and safety plan. Individuals whose current certificates are not on file, or those with more recent training records (have attended a refresher course), must provide the onsite supervisor with a copy of their certificate before entering any work area.

Subcontractors, Department of Defense (DOD) oversight personnel, and other site visitors must also demonstrate compliance with the requirements specified above, before being designated as authorized personnel.

5.1.4 Zone Research

Section 5.5 describes sites, physical hazards, appropriate controls, and PPE. The work zones for each site will be established in the field, based on the work task, site layout, and other logistic factors.

5.2 Employee Protection

Employee protection for the work to be completed under the Zone J RFI Work Plan was determined through research of site conditions, planned activities, and identification of site-specific physical and chemical hazards. This section identifies the chemical and physical hazards that are to be expected by site workers during the investigation of Zone J. The site hazards and hazard abatement procedures are discussed in general in the following sections and specifically for each work site in Section 5.5.

5.2.1 Work Limitations

All site activities will be conducted during daylight only. All personnel scheduled for these activities must have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional eight hours of HAZWOPER Site Supervisor training. All personnel must complete an eight-hour refresher training course annually to continue working at the site.

5.2.2 Zone J Physical Hazards

Field personnel should be aware of the dangers associated with physical hazards typically encountered during environmental investigations and act in a manner to lessen these dangers. These hazards include heat-related illnesses, severe weather, contact with aboveground utilities, working with and around drill rigs and heavy equipment, uneven terrain, slippery surfaces, and lifting. The presence of poisonous flora and fauna such as poison ivy and venomous snakes is expected in most Zone J areas.

Potential Physical Hazards: In addition to physical hazards listed above, site workers should be aware of potential physical hazards such as underground utilities (high-voltage, sewer and storm water, natural gas, potable water lines), MAPP gas (welding gas containing acetylene), oxygen tanks, salt water, steam and compressed air lines, and working in confined spaces.

5.2.2.1 Underground Utilities

Before drilling or conducting an intrusive activity with the potential to penetrate a utility line, at a minimum, the following steps must be taken at each location, for each well or penetration:

- Conduct a surficial resistivity and magnetic survey to locate underground utilities.
- Offset drilling location from located utility allowing a minimum of 5 feet.

- Core asphalt and concrete.
- When an offset is impossible in areas where underground utilities may be present the individual(s) actually doing the invasive work (drilling, posthole digging, hand auguring) shall wear boots and gloves that provide electrical insulation.

5.2.2.2 Procedures for Hot or Cold Weather Conditions

The Site Supervisor and the Site Health and Safety Officer (SHSO) shall be aware of the potential for heat stress and other environmental illnesses. When necessary, work regimens shall be implemented that minimize the potential for employee illness. At these times field staff need to be reminded to regularly check their co-workers for signs or symptoms of hot or cold-induced illness. For a discussion of the more common heat and cold related illnesses and their associated symptoms, see Section 5.5.1 of the CHASP.

Heat stress will be monitored during hot weather conditions and when higher levels of PPE are used.

5.2.2.3 Severe Weather Conditions

Do not conduct fieldwork when lightning can be seen from the work area. When lightning is observed, stop work, perform emergency decontamination of personal and equipment as needed (see Sections 5.3.2 and 5.3.3), then seek shelter.

During extreme weather conditions, Site Supervisors shall use their judgment as to determine when to stop fieldwork or dismiss workers for the day. Conditions that may warrant work stoppage include high winds, hail, flooding, and ice storms. While prudence should always be used, for conditions such as an expected ice storm, it is best to cancel work early enough to allow workers to get home before road conditions become dangerous.

5.2.2.4 Working Around Drill Rigs and Heavy Equipment

Heavy equipment and drill rigs will be operated in accordance with the procedures outlined in the CHASP, Appendix B, Drilling Safety Guide.

In addition to the standard safe work practices listed in Section 5.2.2.7, work practices below apply to employees and contractors handling potentially contaminated materials or frequenting areas where contamination is present.

5.2.2.5 Waterborne Operations

Motorized boats less than 26 feet long must be used as follows:

- Each person shall wear a United States Coast Guard (USCG) approved Type I, II, or III personal flotation device (PFD) while on board.
- Only personnel with boating experience may operate the boat.
- The boat shall be operated at safe speeds at all times.
- Boats should be operated during warm weather (if possible) to lessen cold stress. Bulky clothing also increases potential for falling overboard.
- Boats will not be operated in rough water or during severe weather conditions (e.g., thunder or lightning).
- Smoking is prohibited while onboard.
- All required equipment (listed below) shall be on board before departure.

Equipment Required for Each Boat Used by Field Personnel

- One Type I, II, or III PFD per passenger
- One Type IV PFD (throw cushion) with rope
- One USCG B-I Fire Extinguisher
- Anchor and line (rope length should be approximately five times the water depth).
- Visual distress signal (flag)
- Airhorn
- First-aid kit
- Sunscreen with a sun protection factor (SPF) of 15 or greater
- Mobile phone with watertight carrying case

5.2.2.6 Standard Safe Work Practices

- Eating, drinking, chewing gum or tobacco, smoking, or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the SHSO.
- Hands and face must be thoroughly washed upon leaving the work area.
- No contact lenses will be worn in work areas while invasive activities are conducted.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as practical after leaving the CRZ.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, or discolored surfaces, or lean, sit, or place equipment on drums, containers, or soil suspected of being contaminated.

- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Consumption of alcoholic beverages is prohibited.
- Adequate side and overhead clearance must be maintained to ensure that the drill rig boom does not touch or pass close to any overhead power lines or other overhead obstacles or obstructions.
- NAVBASE Public Works and local utility representatives shall be contacted and requested to identify all underground utility lines. Utility lines should be marked using characteristic spray paint or labeled stakes. A buffer zone, 3 yards to either side of a utility line, should be maintained during all subsurface investigations.
- Due to the flammable properties of the potential chemical hazards, all spark or ignition sources should be bonded and/or grounded or mitigated before soil boring advancement or other site activities begin.

5.2.2.7 General Rules of Conduct

- Liquor, firearms, narcotics, tape recorders, and other contraband items are not permitted on the premises.
- Any violation of local, state, or federal laws, or conduct which is outside the generally accepted moral standards of the community is prohibited.
- Violation of the Espionage Act, willfully hindering or limiting production, or sabotage is not permitted.

- Willfully damaging or destroying property, or removing government records is forbidden.
- Misappropriation or unauthorized alteration of any government records is forbidden.
- Securing government tools in a personal or contractor's tool box is forbidden.
- Gambling in any form, selling tickets or articles, taking orders, soliciting subscriptions, taking up collections, etc. is forbidden.
- Doing personal work in government shop or office, using government property or material for unauthorized purposes, or using government telephones for unnecessary or unauthorized local or long distance telephone calls is forbidden.
- Compliance with posted signs and notices is required.
- Boisterousness and noisy or offensive work habits, abusive language, or any verbal, written, symbolic, or other communicative expression which tends to disrupt the work or morale of others is forbidden.
- Fighting or threatening bodily harm to another is forbidden.
- Defacing any government property is forbidden.
- Wearing shorts of any type and/or offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes, and pants, slacks, or coverall-type garments will be worn at all times on government property.
- All persons operating motor vehicles will obey all NAVBASE traffic regulations.

5.2.2.8 Medical Monitoring Program

See CHASP Section 7.0.

5.2.3 Chemical Hazards

Selecting Chemicals of Potential Concern

The COPCs for each investigative site are based on review of the RFA. Where the RFA identifies specific COPCs, those chemicals are listed. However, where historical information does not identify the use or disposal of specific COPCs, the work plan specifies only chemical classes.

For measuring, evaluating, and preventing worker exposures, the procedures outlined in this plan will account for all available information and will base control procedures and PPE on worst-case assumptions. Section 5.5, Site-Specific Information, will identify the known chemical hazards and will base exposure monitoring, controls, and PPE on that information. If only the chemical class is known, exposure monitoring, control procedures, and PPE will be designed to accommodate a wide range of chemicals within the class or classes. Due to the lack of reliable historical data for some sites within Zone J, E/A&H will approach each site investigation with appropriate caution and with site workers trained and equipped to measure and identify chemical hazards potentially generated during each intrusive procedure. Chemical hazards are selected to represent the range of acute and chronic health (toxicologic) hazards that are, or may be foreseeably present onsite. That is, not every chemical known or suspected of being present is listed as a chemical hazard. Rather, one or two of the most toxic or most prevalent contaminants within a class of chemicals are listed. To illustrate this principle, listed below are classes of chemicals or chemical categories in one column, and examples of chemical hazards in the second column.

Class of Chemical/Product	Potential Contaminant of Concern
• Chlorinated solvents	Perchloroethylene, chloroform, trichloroethylene,
• Degreasers	Methylene chloride, and 1,1,1-trichloroethane
• Nonchlorinated solvents	Benzene, toluene, xylene, ethylbenzene, hexane, and 2-butanone
• Metals/heavy metals	Lead, cadmium, chromium (especially hexavalent chrome), mercury, silver, and copper
• Fuels — gasoline, fuel oil, diesel, lubricants, oils	Benzene, toluene, tetraethyl lead, kerosene, xylene, hexane
• Paints	See solvents and metals above, plus tributyltin
• Pesticides — chlorinated	DDT, DDE, chlordane, deildrin, and endrin

5.2.4 Selection of Personal Protective Equipment

It is important that specified PPE protect against known and suspected site hazards. Protective equipment is selected based on the types, concentrations, and routes of personal exposure that may be encountered. In situations where the types of materials and possibilities of contact are unknown or the hazards are not clearly identifiable, a more subjective determination must be made of the PPE required, and greater emphasis placed on experience and sound safety practices. As discussed above, PPE for site workers will be based on previous site history and the activities performed there. Section 5.5 will describe the site, discuss planned work there, assess the hazards, and specify the PPE for those activities, based on the site chemical and physical hazards.

PPE requirements are subject to change as site information is updated or changes. A decision to deviate from specified levels of PPE as contained in this ZJHASP must be made or reviewed by the Project Health and Safety Officer (PHSO). Table 5-1 presents the exposure

information associated with Zone J. Table 5-2 presents the levels of PPE which may be employed in Zone J, and the criteria for upgrading PPE.

5.2.5 Air Monitoring

Air will be monitored for VOCs, respirable dust, oxygen, and flammable gases continuously during all intrusive investigative activities and those which require E/A&H personnel to handle potentially contaminated materials. Individuals will also be monitored to determine exposure concentrations. Personnel samples will be collected and analyzed with respect to National Institute for Occupational Safety and Health (NIOSH) *Manual of Analytical Methods*, as required per 29 CFR 1910.1000. Personnel samples will be collected during each site activity in which Level C PPE is prescribed. Additional personal samples will be collected during site activities which represent worst-case exposure potential.

When possible, real-time monitoring of airborne contaminant levels will be conducted. Air will be monitored for VOCs using a photoionization detector (PID) field-calibrated to measure VOCs relative to a 100 ppm isobutylene standard. If VOCs are detected downhole, use colorimetric detector tubes and/or other sampling media to determine the identification and approximate concentration of these compounds.

The PHSO reserves the right to require personal exposure monitoring or other types of air sample collection and analysis. These samples may be required for a variety of reasons such as: to identify a chemical odor, PID readings exceed or approach the action levels, or to determine if personal exposures are below Occupational Safety and Health Administration (OSHA) permissible exposure levels (PELs).

Air will be monitored for total (inspirable) dust using a real-time aerosol monitor. Air samples will also be collected to document the actual concentrations measured per a NIOSH-approved method.

Table 5-1
 Zone J Chemical Hazards
 Exposure Information

Compound	Ionization	Odor	OSHA PEL ^c	ACGIH TLV ^d	NIOSH REL ^e	Action Level
Solvents/Degreasers (ppm)						
Benzene	9.25 eV	4.7	1 5 — STEL	10 (Suspected Human Carcinogen)	0.1 1 — Ceiling (Potential Occupation Carcinogen)	0.5
Ethylbenzene	8.8 eV	140	100 125 — STEL	100 125 — STEL	Not Listed	50
Toluene	8.8 eV	40	100 150	50 (Skin)	100 200 — Ceiling	25
Trichloroethylene	9.5 eV	50	50 200 — STEL	50 100 — STEL	25 (Potential Occupational Carcinogen)	12
Xylene	8.6 eV	0.05	100 150 — STEL	100 150 — STEL	100 200 — Ceiling	50
Metals (mg/m ³)						
Lead	NA	NA	0.05	0.15	<0.1	0.025
Tributyl tin	NA	NA	0.1	0.1	0.1	0.05

Table 5-1
Zone J Chemical Hazards
Exposure Information

Compound	Ionization	Odor	OSHA PEL ^c	ACGIH TLV ^d	NIOSH REL ^c	Action Level
Pesticides (mg/m³)						
Chlordane	13.4 eV	Not Listed	0.5 (Skin)	0.5 (Skin)	Potential Occupational Carcinogen	0.25
DDE	Not Listed	Not Listed	Not Listed	Not Listed	Not Listed	—
DDT	Not Listed	Not Listed	1 (Skin)	1	0.5	0.25
Dieldrin	Not Listed	0.041	0.25 (Skin)	0.25 (Skin)	Potential Occupational Carcinogen	0.12
Endrin	Not Listed	Not Listed	0.1 (Skin)	0.1 (Skin)	Not Listed	0.05
Malathion	Not Listed	Not Listed	10	10 (Skin)	15	5
Parathion	Not Listed	Not Listed	0.1 (Skin)	0.1 (Skin)	0.05	0.025
Additional Site Contaminants (mg/m³)						
Benzo (a) pyrene	NA	NA	0.2	0.2 (Confirmed Human Carcinogen)	0.1 (Potential Occupational Carcinogen)	0.1
Dioxin 2,3,7,8-TCDD	NA	NA	NA	NA	NA	NA
Dioxin 2,3,7,8-TCDD	NA	NA	NA	NA	NA	NA

Notes:

- ^a = NIOSH Pocket Guide to Chemical Hazards, June 1990.
- ^b = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values.
- ^c = 129 CFR 1910.1000, Table Z-1-A. Limits For Air Contaminants.
- ^d = 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH.

Table 5-2
Level of Protection and Criteria

Level of Protection	Criteria for Use	Equipment
Level A	<ul style="list-style-type: none"> • When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guides.) • When known atmospheres or potential situations could affect the skin or eyes or be absorbed into the body through these surfaces. Consult standard references to obtain concentrations hazardous to skin, eyes or mucous membranes. • Potential situations include those where immersion may occur, vapors may be generated or splashing may occur through site activities. • Where atmospheres are oxygen deficient. • When the type(s) and or potential concentration of toxic substances are not known. 	<ul style="list-style-type: none"> • Positive-pressure, full-face piece, self-contained breathing apparatus (SCBA) or positive-pressure supplied air respirator (SAR) with escape SCBA. • Fully encapsulating chemical protective suit. • Chemical-resistant inner and outer gloves. • Steel toe and steel shank chemical-resistant boots. • Hard hat under suit. • Two-way radios worn inside suit. • Optional: coveralls, long cotton underwear, disposable protective suit, gloves and boots, over fully encapsulating suit.
Level B	<ul style="list-style-type: none"> • When respiratory protection is warranted and cartridge respirators are not appropriate. Examples of these conditions are when: <ul style="list-style-type: none"> — Work area may contain less than 19.5% oxygen, — Expected contaminants do not have appropriate warning properties, e.g., vinyl chloride — Cartridges are not available to protect against all contaminants of concern. • Hazards associated with limited dermal exposure are not significant. 	<ul style="list-style-type: none"> • Chemical-resistant clothes, coveralls. • Positive-pressure, full-face SCBA or SAR with escape bottle. • Hard hat. • Chemical-resistant outer and inner gloves. • Steel toe and steel shank boots. • Chemical-resistant outer boots.
Level C	<ul style="list-style-type: none"> • When respiratory protection is warranted and cartridge respirators are appropriate. • When PID readings exceed the Action Level. • When air monitoring indicates airborne concentration of a chemical is 50% or more of the PEL or TLV • And the work area contains at least 19.5% oxygen. 	<ul style="list-style-type: none"> • Chemical-resistant coveralls. • Full-face, air purifying respirator equipped with cartridges suitable for the hazard. • Hard hat. • Chemical-resistant outer and inner gloves. • Steel toe and steel shank boots. • Disposable outer boots.

Table 5-2
Level of Protection and Criteria

Level of Protection	Criteria for Use	Equipment
Modified Level D	<ul style="list-style-type: none"> • When chemical contamination is known or expected to be present, yet inhalation risk is low and respiratory protection is not required. • Site contaminants may be absorbed through the skin. • The "default level" of PPE required when the ZJHASP does not specify another level of PPE. • And the work area has at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> • Chemical-resistant coveralls. • Chemical-resistant outer gloves; inner gloves or glove liners, optional. • Steel toe and steel shank boots. • Hard hat. • Safety glasses with side shields or safety goggles. • Optional: chemical-resistant outer boots.
Level D	<ul style="list-style-type: none"> • When minimal or no chemical contamination is expected. • When ZJHASP specifies Level D protection is adequate. • And the work area has at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> • Inner gloves or chemical-resistant gloves needed to handle soil or water samples. • Steel toe and steel shank boots. • Hard hat. • Safety glasses with side shields or safety goggles. • Optional: coveralls and disposable outer boots. • Work clothes.

Notes:

PEL = Permissible Exposure Limit
 TLV = Threshold Limit Value
 OSHA = Occupational Safety and Health Administration

A combustible gas indicator (CGI) that has been field-calibrated to measure flammable gases relative to a methane standard will be used during all soil borings and well installations. Downhole CGI readings will be collected periodically during soil-disturbing operations. Field activities will cease immediately if downhole readings exceed 20 percent of the lower explosive limit (LEL). If CGI readings do not subside, the area will be immediately evacuated and the situation re-evaluated to determine how to proceed. Operations may not proceed until downhole readings are below 20 percent LEL.

Action Level and Ceiling Concentration

Each site at NAVBASE has a designated action level (AL) and ceiling concentration. For this project the AL is defined as the PID reading in the breathing zone above which respiratory protection must be upgraded; chemical protective clothing may also be upgraded. This level is determined on a site-by-site basis. To officially exceed the AL, PID readings should remain above the AL for at least one minute. Readings that exceed the action level for only a couple of seconds every 15 or 20 minutes do not require workers to upgrade their level of PPE.

The general AL for this zone, as determined on a properly calibrated PID, is 5 PID units above background. PPE shall be upgraded to Level C (assuming that cartridge respirators are appropriate, otherwise Level B) if airborne VOC concentrations in the breathing zone exceed the AL, or if the concentration of any contaminant exceeds 50% of the OSHA PEL. This baseline AL and PPE requirement may be superseded by more stringent site-specific levels, as identified in each Site Chemical Hazard and PPE Requirements section.

If breathing zone levels exceed the AL, or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact the Project Manager and/or the PHSO. The PHSO will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. See Table 5-2 for specific criteria for each protection level.

If PID readings exceed 10 units the SHSO shall contact the PHSO and discuss the need to identify and quantify airborne contaminants. Work shall not proceed until breathing zone levels return to background levels and it is reasonably anticipated that breathing zone readings will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

The ceiling concentration is defined as the maximum allowable PID reading in the breathing zone regardless of PPE. A ceiling concentration of 50 PID units has been established. If VOC levels exceed 50 ppm in the breathing zone, fieldworkers should secure their equipment and back off the site. Work shall not resume until the Site Supervisor understands why VOC levels became elevated, knows the major constituents of the VOCs being generated, and the VOCs in the breathing zone are less than 5 ppm or workers have upgraded to Level C or B. The proper PPE upgrade shall be determined by the PHSO based on site-specific chemical information, i.e., available information is sufficient to determine that air-purifying respirators will provide adequate protection.

Field monitoring values will be recorded in a field logbook and copies must be posted for review by field personnel.

Equipment Maintenance

Before being used on a daily basis, PIDs, CGIs, and other monitoring equipment shall be calibrated or their proper function verified. Throughout the day, this equipment shall be periodically checked to ensure that it is working properly. A final calibration shall be conducted at the end of the workday, at which time each instrument will be checked to ensure that it is free from surface contamination. Air monitoring equipment must be able to detect the calibration standard within a range of plus or minus 10%, otherwise the instrument shall be considered malfunctioning. Field staff shall note in their field notebooks that they conducted these calibrations and checks and record whether specific equipment was functioning properly.

When equipment is not functioning properly, the Site Supervisor or SHSO should be notified so the equipment can be repaired or replaced, as needed.

5.3 Decontamination

5.3.1 Personnel and Equipment Decontamination

As needed, a CRZ will be established adjacent to EZs established for invasive activities, and will include stations for decontaminating personnel, PPE, and hand tools. Typically, a portion of the CRZ will be covered with sheets of 6-mil polyethylene (generally, an area 20 feet by 20 feet is sufficient) with specific stations to accommodate the removal and disposal of the protective clothing, boot covers, gloves and respiratory protection.

Heavy equipment and field equipment that cannot adequately be decontaminated in the CRZ may be decontaminated on a more centrally located decontamination pad. The following equipment may be used to decontaminate heavy equipment and vehicles:

- *Storage tanks or drums* to be used for storing collected wash and rinse solutions, alternatively. Equipment for the treatment of collected wash and rinse solutions may be substituted.
- *Pumps and filters* as needed for the collection of wash and rinsate solutions.
- *Pressurized steam sprayers* for steam-cleaning equipment, particularly hard to reach areas.
- *Long-handled brushes* for general cleaning of exterior surfaces. *Shovels* and other equipment may be used to dislodge caked-on contaminated mud on the undercarriage or in the tires.
- *Wash solutions* selected for their ability to remove (dissolve, etc.) contaminants.
- *Rinse solutions* selected for their ability to remove contaminants and wash solutions.

- *Clean buckets* that can contain cleaning and rinsing solutions.
- *Brooms and brushes* that can be used to clean the interior, operator areas of vehicles and equipment.

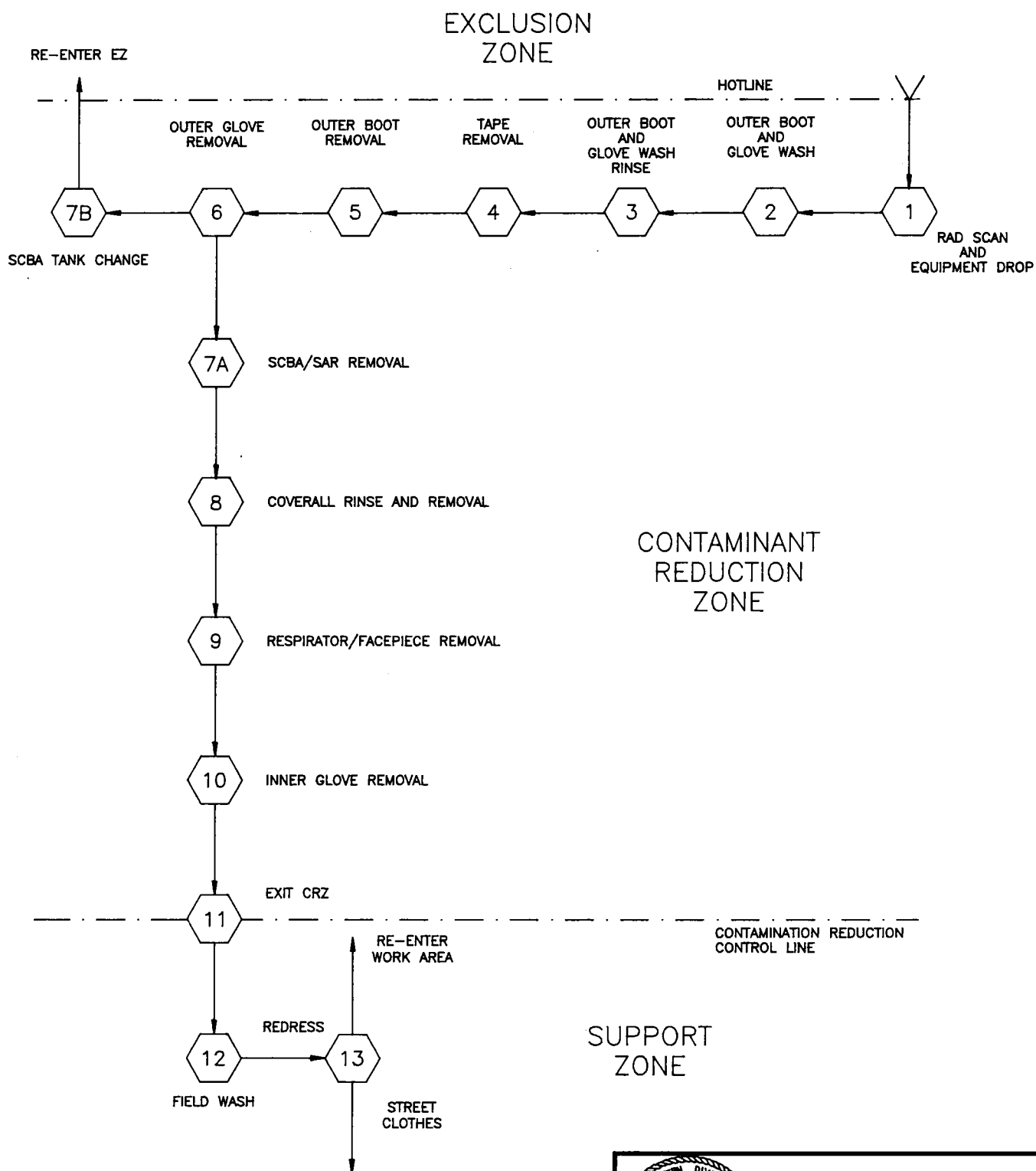
Figure 5-1 shows just one method of establishing an acceptable decontamination area for Level B PPE. Decontamination areas for Level C and Modified D PPE should be based on this concept of decontamination, but can be scaled back in accordance with the decontamination needs of the specific site and level of PPE. As a general rule, persons working in the CRZ, or those assisting in the decontamination of workers leaving the EZ, shall be outfitted in PPE that is one protection level below what the exiting workers are using. For example, if workers leave the EZ in Level C, personnel in the CRZ should be in Modified D.

Equipment often may be adequately decontaminated using a soapy wash solution and by following specified rinsing procedures. Normally, equipment decontamination will be completed in Level D with gloves or Modified D PPE.

In the event of inclement weather (e.g., lightning) or an emergency requiring immediate evacuation, contaminated equipment will be bagged or wrapped and taped in 6-mil polyethylene sheeting and tagged as "contaminated" for later decontamination. Respirators not only need to be decontaminated and cleaned between uses, but also sanitized. Alcohol swabs are generally sufficient.

5.3.2 Full Decontamination Procedures

Workers shall use the following cleaning and decontamination procedures when exiting the EZ for lunch, at the end of their shift, or when work is completed for an EZ. Procedures for rest breaks, changing self-contained breathing apparatus (SCBA) tanks and cartridges are described



ZONE J HASP
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 5-1
FULL DECONTAMINATION LAYOUT
LEVEL B PROTECTION

Final Zone J RFI Work Plan
Naval Base Charleston
Revision No. 2
September 10, 1996

This page intentionally left blank.

in Section 5.3.3. Not all steps apply to every situation; follow applicable procedures. Decontamination procedures shall start at the EZ/CRZ interface and continue away from the EZ towards the SZ.

Full Decontamination

1. ***Radiation monitoring.*** If radioactive monitoring is in effect, scan hands, feet, and equipment with radiation detector.
2. ***Equipment drop.*** Deposit used equipment onto plastic drop cloths or into a plastic-lined tub. All gross contamination should be removed here; fine cleaning and decontamination of equipment may be completed here or elsewhere. Before moving equipment that is still contaminated, it must be wrapped and taped.
3. ***Outer boot and glove wash.*** Wash/remove gross contamination from outer boots, outer gloves, SCBA and/or supplied air respirator (SAR) equipment.
4. ***Tape removal.*** Remove tape from ankles and wrists and dispose of tape in plastic-lined drum.
5. ***Outer boot removal.*** Remove outer boots; disposable outer boots may be disposed of in the same waste container used in Step 4. Nondisposable boots need a thorough cleaning before they can be removed from the site. (If nondisposable boots are used, it is preferable to have them dedicated to the project.)
6. ***Outer glove removal.*** Remove and dispose of outer gloves in the same waste container as used in Step 4.

7. **SCBA and SAR removal.** For Level B.

SCBA — With buddy or other site worker, remove backpack; remove face piece and shut off air flow.

SAR — With buddy or other site worker, remove harness and escape bottle, remove face piece, and shut off air flow.

* If coveralls are significantly contaminated, leave the respirator face piece on, disconnect the air hose below the regulator, turn off the flow of air, remove the backpack or equipment harness, and leave the face piece in place temporarily.

8. **Coverall removal.** Rinse coveralls, if needed, then remove coveralls and dispose of them in the same drum used in Step 4. Nondisposable coveralls shall be double-bagged and the outer bag clearly labeled "contaminated."
9. **Respirator removal.** Remove respirator (or face piece of Level B equipment, if it is still being worn). Dispose of spent cartridges, clean, disinfect, dry and properly store respirator or face piece.
10. **Inner glove removal.** Remove and dispose of inner gloves.
11. **Exit area.** Exit the CRZ via the SZ.
12. **Field Wash.** Wash and rinse hands and face.
13. **Redress.** Don appropriate PPE for re-entry or change into clean clothes.

Notes:

- All wastes (soil and water) generated during personal decontamination will be collected in 55-gallon drums. The drums will be labeled by E/A&H personnel; final disposal will be by the Navy.
- Hard hats and eye protection should be washed at the end of each workday with a soap and water solution.

5.3.3 Partial Decontamination Procedures

To change a respirator cartridge or SCBA tank:

1. ***Radiation monitoring.*** If radioactive monitoring is in effect, scan hands, feet, and equipment with radiation detector.
2. ***Outer boot and glove wash.*** Wash outer boots and gloves. Wash/remove gross contamination from SCBA and/or SAR equipment.
3. ***Tape removal.*** Remove tape from ankles and wrists and dispose of tape in a plastic-lined drum.
4. ***Face piece removal.*** Disconnect face piece and air hose below regulator. The face piece may remain in place, or be removed and cleaned. Remove the spent tank from the backpack and replace it with a full tank. Connect air hose and turn on air.
5. ***Respirator removal.*** Remove respirator and discard used cartridges, clean and disinfect respirator, install new cartridges, and don respirator.

6. ***Respirator check.*** Check to make sure that respirator still seals properly to your face (positive/negative pressure check).
7. ***Don clean PPE.*** Put on clean outer gloves, tape wrists (as applicable), and re-enter EZ.

When taking a rest break:

1. ***Follow procedures 1 through 3 as shown above.***
2. ***Face piece/Respirator removal.*** Remove SCBA unit, airline harness or respirator, and place in a clean area, plastic sheeting may be needed.
3. ***Coverall removal.*** Remove outer wear if it is ripped or significantly contaminated. In hot weather, at least unzip and pull down upper half of coveralls.
4. ***Inner glove removal.*** Remove and dispose of inner gloves.
5. ***Wash.*** Wash and rinse hands and face at the field wash station.
6. ***Rest break.*** Take rest break. Drink plenty of water, Gatorade, or similar beverage.
7. ***Don inner gloves.*** Put on inner gloves.
8. ***Don PPE.*** Don coveralls, outer boots and outer gloves. Tape wrists and ankles (as needed), and re-enter the EZ.

Decontamination procedures, based on Level D protection:

1. Brush heavily soiled boots and rinse outer gloves and boots with soap and water.

2. Remove gloves and deposit them in a trash container.
3. Dispose gloves and other disposable PPE in a trash container.
4. Wash hands and face, and preferably shower as soon as practical.

5.3.4 Closure of the Decontamination Station

All disposable clothing and plastic sheeting used at Level D through Level C sites will be double-bagged and disposed of in a refuse container. Decontamination and rinse solutions and disposable PPE from Level B site will be placed in a labeled 55-gallon drum (separate solids and liquids) for later analysis and disposal. All washtubs, pails, buckets, etc. will be washed and rinsed at the end of each workday.

5.4 Authorized Personnel

Personnel anticipated to be onsite at various times during site activities include:

- | | |
|--------------------------------------|------------------------|
| • Engineers-in-Charge
(SOUTHDIV) | Matthew A. Hunt |
| • Site Contact | Amos Webb (NAVBASE) |
| • Principal-in-Charge | James Speakman (E/A&H) |
| • Task Order Manager/Project Manager | Todd Haverkost (E/A&H) |
| • Project Health & Safety Officer | John Borowski (E/A&H) |
| • Site Supervisor | Jay Cornelius (E/A&H) |
| • Site Health & Safety Officer | Tim McCord (E/A&H) |

Responsibilities of Key Field Staff

Key field staff for this project, in terms of health and safety are:

- Site Supervisor,
- Project Health and Safety Officer,

- Site Health and Safety Officer, and
- (All) Field Staff.

The primary health and safety responsibilities associated with each of these positions are delineated in CHASP, Sections 8.1, 8.2, and 8.3 respectively.

5.5 Site-Specific Information

The following sections provide site-specific information regarding planned activities, specific chemical and physical hazards, and hazard abatement procedures in Zone J.

Due to the potential dermal hazards associated with handling soil, sediment, surface water, and groundwater at the Zone J sites, the initial level of PPE for invasive field activities performed at all Zone J sites is modified Level D with nitrile inner and outer glove (see Table 5-2 for PPE Protection Levels and Criteria). The Action Level for these sites is a continuous PID reading of 5 ppm or greater in the breathing zone. If 5 ppm above background is measured continuously for more than two or three minutes, the required PPE level shall be upgraded to Level C.

5.5.1 ESA I — Warehouse/DRMO Area

AEC I-1 is a small isolated palustrine scrub-shrub wetland in a grassy area northwest of Building 1648. This 1-acre wetland receives surface water runoff from the surrounding paved areas. Scrub-shrub vegetation is thick in the center of the wetland and several small ornamental trees were also planted on its western perimeter. Lead is the chemical hazard associated with this site. Refer to Section 5.2.3 for chemical hazard information and Table 5-1 for chemical hazard exposure guidelines. Refer to Appendix E for site chemical hazard Material Safety Data Sheets (MSDSs).

Site Activities

No additional sampling is proposed to characterize the COPCs within and near the wetland. Additional sampling may be conducted to complement the AOC/SWMU sampling plans proposed in the *Zone A RFI Work Plan*.

Hazard Analysis and Employee Protection

These sites were investigated previously in the Zone A RFI. If contaminants other than lead are identified during Zone A or Zone J investigations, MSDSs will be immediately obtained, reviewed, and incorporated into Appendix E. Site physical hazards are related to ambient weather conditions. Zone J physical hazards and hazard abatement procedures are discussed in Section 5.2.2.

5.5.2 ESA II — Golf Course/Noisette Creek/Officer Housing

Primary land uses in ESA II are recreational and residential. An 18-hole golf course occupies the northern half of the ESA. The course is divided by Noisette Creek, a small, tidally influenced tributary flowing eastward to the Cooper River. This feature is the primary AEC within ESA II and likely receives surface water runoff from the golf course as well as upstream off-base properties. Chemical hazards associated with the area are pesticides and herbicides. Refer to Section 5.2.3 for chemical hazard information and Table 5-1 for chemical hazard exposure guidelines. Refer to Appendix E for site chemical hazard MSDSs.

Site Activities

Six surface water/sediment samples are proposed to characterize the COPCs within Noisette Creek and associated wetlands.

Hazard Analysis and Employee Protection

A review of site information provides insufficient information for E/A&H to compile a complete list of potential chemical hazards. If contaminants other than pesticides and herbicides are

identified during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into Appendix E. Site physical hazards are related to ambient weather conditions and waterborne operations. Zone J physical hazards and hazard abatement procedures are discussed in Section 5.2.2.

5.5.3 ESA III — Northern Industrialized Area

AEC III-1 is an approximately 1.5-acre undeveloped area northeast of Avenue F and Kenney Lane is a palustrine emergent persistent, semipermanently flooded wetland. The chemical hazards associated with nearby AOCs/SWMUs are petroleum products, oils, paints, solvents, and products of incomplete combustion. AEC III-2 is Facility 910, a storm water detention pond at the northeast corner of McMillan and St. John's avenues. There are no known chemical hazards associated with this pond. AEC III-3 is the eastern edge of a palustrine emergent wetland extending across the western property line near Building 1794. Chemical hazards include petroleum products, oils, paints, and solvents. Refer to Section 5.2.3 for chemical hazard information and Table 5-1 for chemical hazard exposure guidelines. Refer to Appendix E for site chemical hazard MSDSs.

Site Activities

Four surface water/sediment samples are proposed in AEC III-1, one at each outfall to assess onsite contamination migration and one at the northern culvert to assess offsite migration. Five surface water/sediment samples are proposed for AEC III-2, four in the western basin and one at the spillway of the eastern basin. Four surface water/sediment samples are also proposed for AEC III-3, one at the pair of outfalls which discharge directly into the wetland, one in the detention pond, one in the eastern ditch, and one in the center of the offsite wetland.

Hazard Analysis and Employee Protection

A review of site information provides insufficient information for E/A&H to narrow the list of potential chemical hazards. The site-specific potential chemical hazards are specified above.

If additional contaminants of concern are identified during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into Appendix E. Site physical hazards are related to ambient weather conditions and waterborne operations. Zone J physical hazards and hazard abatement procedures are discussed in Section 5.2.2.

5.5.4 ESA IV — Southern Industrialized Area

AEC IV-1 is a 5-acre open field and palustrine scrub shrub wetland area near Warehouse 224. The chemical hazards associated with this site include petroleum products and oils. Refer to Section 5.2.3 for chemical hazard information and Table 5-1 for chemical hazard exposure guidelines. Refer to Appendix E for site chemical hazard MSDSs.

Site Activities

Eight surface water/sediment samples are proposed for AEC IV-1 and will be collected as part of the Zone G RFI, one at each of the three ditches leading into the wetland area, one in the center of the marsh area, one at the western drainage ditch where it crosses beneath the dirt access road, and one at the unknown outfall. Two additional samples will be collected at each end of the culvert leading from SWMU 11 to the offsite wetland.

Hazard Analysis and Employee Protection

These sites have not been investigated previously. A review of site information provides insufficient information for E/A&H to narrow the list of potential chemical hazards. If any additional contaminants of concern are identified during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into Appendix E or the Zone G RFI. Site physical hazards are related to ambient weather conditions and waterborne operations. Zone J physical hazards and hazard abatement procedures are discussed in Section 5.2.2.

5.5.5 ESA V — Southern Open Areas

AEC V-1 is the palustrine forested wetland along the headwaters of Shipyard Creek and between Plate Street and Bainbridge Avenue. AEC V-2 is the estuarine intertidal wetland southwest of the athletic fields and the equally large palustrine forested wetland south of Building 655. There are no known chemical hazards associated with either AEC. AEC V-3 is the dredge disposal area, potentially contaminated with petroleum, dioxins, and tricyclic aromatic compounds. Refer to Section 5.2.3 for chemical hazard information and Table 5-1 for chemical hazard exposure guidelines. Refer to Appendix E for site chemical hazard MSDSs.

Site Activities

No further site activities are proposed at this location unless additional soil, sediment, and surface water sampling is necessary to further determine ecological risk. Previous fieldwork for this site is described in Section 4.2 of this work plan.

Hazard Analysis and Employee Protection

A large portion of these sites has been investigated previously. A review of available site information provides sufficient information for E/A&H to compile a complete list of potential chemical hazards. The site-specific potential chemical hazards are specified above. If additional contaminants of concern are identified during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into Appendix E. Site physical hazards are related to ambient weather conditions. Zone J physical hazards and hazard abatement procedures are discussed in Section 5.2.2.

5.5.6 ESA VI — Cooper River and Associated Wetlands

AEC VI is the Cooper River, which flows south along the east shore of NAVBASE and ultimately empties into the Charleston Harbor. It is suspected that numerous contaminants are associated with this water body. Refer to Section 5.2.3 for chemical hazard information and

Table 5-1 for chemical hazard exposure guidelines. Refer to Appendix E for site chemical hazard MSDSs.

Site Activities

Initial site activities include sediment and surface water sampling. Fieldwork for this site is described in Section 4.2 of this work plan.

Hazard Analysis and Employee Protection

These sites has been investigated previously, but these studies do not provide sufficient information to compile a complete list of chemicals of potential concerns. As suspected contaminants of concern are identified during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into Appendix E. Site physical hazards are related to ambient weather conditions and waterborne operations. Zone J physical hazards and hazard abatement procedures are discussed in Section 5.2.2.

5.5.7 ESA VII — Shipyard Creek and Associated Wetlands

AEC VII is Shipyard Creek, a drainage creek to the lower Cooper River partially included in the eastern boundary of NAVBASE that receives the westerly runoff from the central and southern portions of the base. Previous studies indicate elevated concentrations of metals in sediments. Refer to Section 5.2.3 for chemical hazard information and Table 5-1 for chemical hazard exposure guidelines. Refer to Appendix E for site chemical hazard MSDSs.

Site Activities

Initial site activities include sediment and surface water sampling. Fieldwork for this site is described in Section 4.2 of this work plan.

Hazard Analysis and Employee Protection

Portions of this site have been investigated previously and has revealed the presence of metals as the primary contaminant of concern. If additional contaminants of concern are identified during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into Appendix E. Site physical hazards are related to ambient weather conditions and waterborne operations. Zone J physical hazards and hazard abatement procedures are discussed in Section 5.2.2.

5.5.8 ESA VIII — Clouter Island AOCs

AEC VIII is the former Naval Ammunition Depot at the southwestern shore of Clouter Island, on the eastern side of the Cooper River directly across from NAVBASE. Chemical hazards include explosives, petroleum, dioxins, and tricyclic aromatic compounds. Refer to Section 5.2.3 for chemical hazard information and Table 5-1 for chemical hazard exposure guidelines. Refer to Appendix E for site chemical hazard MSDSs.

Site Activities

No Zone J site activities are proposed until the Zone K RFI for noncontiguous sites is prepared. It is expected that the site assessment will include soil, groundwater, sediment, and surface water sampling.

Hazard Analysis and Employee Protection

These sites have not been investigated previously. A review of site information provides insufficient information for E/A&H to narrow the list of potential chemical hazards. As suspected contaminants of concern are identified during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into Appendix E. Site physical hazards are related to ambient weather conditions and waterborne operations. Zone J physical hazards and hazard abatement procedures are discussed in Section 5.2.2.

5.6 Emergency Information

All hazardous waste site activities present a risk to onsite personnel. During routine operations, risk is lessened by establishing good work practices, staying alert, and using proper PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside emergency, immediately call the appropriate contact from the following list:

Contact	Agency or Organization	Telephone
Amos Webb	Naval Base Charleston	(803) 743-5519
Matthew A. Hunt	SOUTHDIV/ Engineer-in-Charge	(803) 743-0525 (803) 743-0513
Law Enforcement	NAVBASE Security	(803) 743-5555
Fire Department	NAVBASE Fire Department	(803) 743-5333
Ambulance Service	NAVBASE Ambulance	(803) 743-5444
Hospitals	Charleston Naval Hospital Baker Hospital	(803) 743-7000 (803) 744-2110
Southern Poison Control Center	_____	(800) 922-1117
Todd Haverkost	EnSafe/Allen & Hoshall Task Order Manager	(803) 747-7937
John Borowski	EnSafe/Allen & Hoshall PHSO	(901) 372-7962
David Trimm	EnSafe/Allen & Hoshall Project Manager	(901) 372-7962

- * Use Charleston Naval Hospital for (potentially) life-threatening situations. For medical needs that are less urgent, the Naval Hospital will not provide service to civilians. Baker Hospital is the next closest hospital.

As soon as practical, the following individuals will be fully appraised of the situation: Amos Webb, NAVBASE; Matthew Hunt, Southern Division (SOUTHDIV) Engineer-in-Charge; Todd Haverkost, E/A&H Task Order Manager; and John Borowski, E/A&H PHSO. Other persons, as appropriate, may also need to be contacted.

5.6.1 Site Resources

A cellular telephone will be available in the support zone for routine and emergency communication/ coordination with NAVBASE, SOUTHDIV, and the E/A&H field office. First-aid and eye wash equipment will be available at the work area and in each field vehicle.

5.6.2 Emergency Procedures

Examples of an emergency include:

- A fire, explosion or similar event occurs at or near the site whether related to this project or not;
- A member of the field crew sustains a significant injury, or experiences symptoms of a chemical exposure; or
- A condition is identified which suggests that site conditions are imminently more dangerous or hazardous than anticipated.

In an emergency, the following emergency procedures should be followed:

- If it is necessary to evacuate the area, immediately proceed to a rally point and remain there until instructed otherwise.
- Use planned escape routes.

- If a member of the field team experiences effects or symptoms of exposure while on the scene, the field crew will immediately cease work and act according to the instructions provided by the Site Supervisor or, in his absence, the SHSO.
- For applicable site activities, including all Level B activities, use wind indicators to continuously display preferred downwind escape routes, from upwind routes.
- Investigate condition(s) suggesting that site conditions may be more hazardous than anticipated. Record the condition observed and the decisions made in the safety logbook, or in the field logbook if a safety logbook is not being maintained.
- If you encounter a potentially hazardous situation and are unsure about how to proceed, suspend work and leave the work area until the PHSO or SHSO has evaluated the situation and provided the appropriate instructions to the field team.
- If an accident occurs, the Site Supervisor is to complete an Accident Report Form (see Appendix D) for submittal to the managing Principal-in-Charge of the project.
- If a member of the field crew suffers a personal injury, the SHSO will call **NAVBASE Fire Department 743-5333** (or 5444 if an ambulance is needed). Also alert appropriate emergency response agencies as the situation dictates. Complete an Accident Report Form for any such incident.
- If a member of the field crew suffers chemical exposure, flush the affected areas immediately with copious amounts of clean water, and if the situation dictates, the SHSO should alert appropriate emergency response agencies, or personally ensure that the exposed individual is transported to the nearest hospital or emergency center for prompt

treatment (see Appendix C for directions). Complete an Accident Report Form for any such incident.

Additional information on appropriate chemical exposure treatment methods will be provided through MSDS in Appendix E of this work plan. Directions to the nearest hospital facility capable of providing general emergency medical assistance and treating chemical burns are provided in Appendix C of this work plan.

5.7 Forms

The following forms will be used in implementing this Health and Safety Plan:

- Plan Acceptance Form
- Plan Feedback Form
- Exposure History Form
- Accident Report Form

A ZJHASP Plan Acceptance Form will be filled out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the SHSO and any other onsite employee who wishes to fill one out. The Exposure History Form will be completed by both the Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Appendix D of this plan.

All completed forms must be returned to the Task Order Manager at EnSafe/Allen & Hoshall, Memphis, Tennessee.

6.0 SIGNATORY REQUIREMENT

Condition I.E. of the Hazardous and Solid Waste Amendments portion of RCRA Part B Permit (EPA SCO 170 022 560) states that *All applications, reports, or information submitted to the Regional Administrator shall be signed and certified in accordance with 40 CFR §270.11.* The certification reads as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Caretaker Site Officer
Naval Base Charleston

9/9/96

Date

7.0 REFERENCE LIST

Ecology and Environment, Inc. July 1995. *Final Environmental Impact Statement for Disposal and Reuse of the Charleston Naval Base, North Charleston, South Carolina*. E&E: Lancaster, New York.

Ecology and Environment, Inc. June 1994. *Draft-Final Environmental Impact Statement for Disposal and Reuse of the Charleston Naval Base, North Charleston, South Carolina*. E&E: Lancaster, New York.

Environmental and Safety Designs, Inc. March 1988. *Report of Field Activities; Closure of Interim Status Hazardous Waste Facilities, Naval Shipyard, Charleston, SC*. EnSafe: Memphis, Tennessee.

EnSafe/Allen & Hoshall. August 1994. *Comprehensive RFI Work Plan. Volumes I, II, and III*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall. May 31, 1994. *RCRA Facility Assessment for Naval Base Charleston, Volume I*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall. June 13, 1994. *RCRA Facility Assessment for Naval Base Charleston, Volume II*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall. May 18, 1994. *Comprehensive Corrective Action Management Plan*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall. March 26, 1993. *Preliminary RFI Field Activity Report (Soil Gas, Geophysics) Charleston, SC*. E/A&H: Memphis, Tennessee.

Environmental Science and Engineering, Inc. October 1986. *Final Contamination and Exposure Assessment for Lead Contamination within the Defense Reutilization and Marketing Office, Charleston Naval Base, Charleston, SC.* ESE: Tampa, Florida.

Environmental Science and Engineering, Inc. May 1993. *Initial Assessment Study of Naval Base Charleston, Charleston, South Carolina.* NEESA Report No. 13-007.

Fetter, C.W. 1993. *Contaminant Hydrology.* Prentice Hall Publishers.

Fiddie, Ted. Charleston Navel Station, Public Works. November 9, 1995. Personal communication with F. Swan of Environmental and Safety Designs, Inc., Memphis, Tennessee.

Frazier, Dave. Charleston Navel Station, Public Works. November 1, and 6, 1995. Personal communication with F. Swan of Environmental and Safety Designs, Inc., Memphis, Tennessee.

Kyser, Brackston. U.S. Army Corps of Engineers, Charleston, South Carolina. November 6 and 8, 1995. Personal communication with F. Swan of Environmental and Safety Designs, Inc., Memphis, Tennessee.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. *Envir. Management.* 19:81-97.

Mathews, Dr. Thomas D. November 4, 1994. Marine Resources Research Institute. Personal communication with D. Trimm of Environmental and Safety Designs, Inc., Memphis, Tennessee.

Moran, Joe. May 4, 1992. South Carolina Department of Wildlife and Marine Resources. Personal communication with C. Mason of Environmental and Safety Designs, Inc., Memphis, Tennessee.

Odom, Hugh. Charleston Navel Station, Public Works. November 9, 1995. Personal communication with F. Swan of Environmental and Safety Designs, Inc., Memphis, Tennessee.

Porcher, Richard D. July 20, 1993. *Final Report: Survey of Rare, Threatened and Endangered Plants of the Naval Base Complex, Charleston, S.C.*, submitted to Commanding Officer, Southern Division.

Ringwood, Amy. Assistant Marine Scientist. Marine Resource Research Institute, South Carolina Department of Natural Resources. November 9, 1994. Personal communication with F. Swan of Environmental and Safety Designs, Inc., Memphis, Tennessee.

Russ, Phil. The Citadel. November 8, 1994. Personal communication with F. Swan of Environmental and Safety Designs, Inc., Memphis, Tennessee.

Scott, Geoff. Division Chef of Marine Ecotoxicology, National Oceanic and Atmospheric Administration. November 8, 1994. Personal communication with F. Swan of Environmental and Safety Designs, Inc., Memphis, Tennessee.

South Carolina Department of Health and Environmental Control. 1993. Water Classifications and Standards, (Regulations 61-68), Classified Waters (Regulations 61-69), Columbia, S.C.

South Carolina Department of Health and Environmental Control. 1992. Statewide Water Quality Assessment FY 1990-1991. Report to Congress Pursuant to Section 305(b) of Federal Water Quality Act.

South Carolina Department of Health and Environmental Control. October 1989. Bureau of Water Pollution Control. *A Review of Charleston Harbor Water Quality Data, 1974-1987*, Technical Report No. 002-89.

South Carolina Department of Health and Environmental Control. December 1989. *Special Organic Sampling of Charleston Harbor Sediments and Tissue*, Technical Report No. 003-89.

South Carolina Wildlife and Marine Resources Department. 1979. *Benthic and Sedimentologic Studies on the Charleston Harbor Ocean Disposal Area, Charleston Harbor Deepening Project*. Final Report.

South Carolina Wildlife and Marine Resources Department. 1992. *Rare, Threatened, and Endangered Species of Berkeley and Charleston Counties*.

U.S. Army Corps of Engineers. 1994. *Sediment Borings and Sampling Charleston Harbor, Cooper River Charleston, South Carolina*. Analytical Results.

- U.S. Army Corps of Engineers. 1987. *Wetland Delineation Manual*. Environmental Laboratory. Vicksburg, Mississippi.
- U.S. Department of the Interior. 1988. *National List of Plant Species that Occur in Wetlands: 1988 National Summary*.
- U.S. Department of the Interior, Fish and Wildlife Service. 1988/1989. National Wetlands Inventory Maps for the Charleston and North Charleston Quadrants.
- U.S. Department of the Interior, Fish and Wildlife Service. January 1991. *Fish and Wildlife Coordination Act Report on Shipyard River Study*.
- U.S. Environmental Protection Agency. *Sampling Protocols for Collecting Surface Waters, Bed Sediments, Bivalves, and Fish for Priority Pollution Analysis* (Versar, Inc. 1981).
- U.S. Environmental Protection Agency. 1994. USEPA Guidance, Final Revised Model HSWA Permit, March 11, 1994.
- U.S. Environmental Protection Agency. February 1994. *EPA Region IV RCRA Case Development Investigation Evaluation: Macalloy Corporation, Charleston, South Carolina*. ESD Project No. 94-0132.
- U.S. Environmental Protection Agency. March 1989. *Ecological Assessment of Hazardous Waste Site: A Field and Laboratory Reference Document* (EPA/600/3-89/013).
- U.S. Environmental Protection Agency. August 1988. *Biological and Chemical Assessment of Sediments from Proposed Dredge Sites in Charleston Harbor*.

- U.S. Environmental Protection Agency. 1989. *Risk Assessment Guidance for Superfund, Vol. 2, Environmental Evaluation Manual*, Interim Final, Washington, D.C.; Office of Solid Waste, Office of Emergency and Remedial Response; EPA Report No. EPA/540/1-89/001.
- U.S. Geological Survey. 1993. 7.5-Minute Quadrangle Maps, Charleston/Berkley Counties. USGS.
- VanDolah, R.F., R.M. Martore, and K.B. Davis. 1989. *Charleston Harbor's Living Resources, A Review of Conditions Following Rediversion*, ASCE July 11-14, 1989. Proceeding of sixth symposium on Coastal and Ocean Management, Charleston, S.C.
- VanDolah, R.F., P.H. Wendt, E.L. Wenner, and P.A. Sandifer. 1990. *A Physical and Ecological Characterization of the Charleston Harbor Estuarine System*. Marine Resources Division SCWMRD, Charleston, S.C.

Appendix A
Checklists for Ecological Study Areas

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT

I. SITE DESCRIPTION

Date: October 17, 1994

1. Site Name: **ESA I — DRMO Area**
Location: **Northern Boundary of base**
Naval Base Charleston
County: **Charleston** City: **Charleston** State: **South Carolina**
2. Latitude: _____ Longitude: _____
3. What is the approximate area of the site? **150 acres**
4. Is this the first site visit? ☒ Yes ☐ No If no, attach trip report of previous site visit(s) if available.
Date(s) of previous site visit(s): **None**
5. Please attach USGS topographic map(s) of the site to the checklist, if available.
See USGS 7.5 Minute Quadrangle for Charleston
6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.
See Final Reports/EBS Surveys
7. The land use on the site is: The area surrounding the site is: (____ mile radius)

____ % Urban	____ % Urban
____ % Rural	____ % Rural
____ % Residential	____ % Residential
<u>99</u> % Industrial (<input checked="" type="checkbox"/> light <input type="checkbox"/> heavy)	<u>50</u> % Industrial (<input type="checkbox"/> light <input type="checkbox"/> heavy)
____ % Agricultural	____ % Agricultural
(Crops: _____)	(Crops: _____)
<u>0</u> % Recreational	<u>25</u> % Recreational

(Describe: note if it is a park, etc.) (Describe: note if it is a park, etc.)

Warehouses, scrapyards **E — Cooper River; S — Golf course, officer housing; N — Hess tank farm; W — offsite residents**

<u>0.5</u> % Undisturbed	<u>25</u> % Undisturbed
<u>0.5</u> % Other	____ % Other

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

☐ Agricultural Use ☒ Heavy Equipment ☐ Mining
☐ Natural Events ☒ Erosion ☐ Other

Please describe;

Area is paved with asphalt, some areas of crushed rock. It appears that run-off from the Hess tank farm has flowed onto Navy property at the north-northwest corner of this ESA causing staining of soil and slight odor. Pilings from an old pier exists along the eastern boundary. Erosion is also evident. Fill material along shore includes concrete blocks and several discarded storage tanks.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Noisette Creek is to the south, as is Base golf course; Creek has fringe wetlands (estuarine emergent); ESA I's Cooper River shore also has fringe wetlands. A small isolated wetland is north of Building 1648.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

National Wetland Inventory map; field observations

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal
☒ other (specify) **DRMO storage yards/warehouses/scrapyards**

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? **Various COCs are suspected - metals, fuel, POL, solvents (see previous E/A&H reports on DRMO).**

12. Check any potential routes of off-site migration of contaminants observed at the site:

☐ swales ☐ depressions ☒ drainage ditches
☒ runoff ☐ windblown particulates ☐ vehicular traffic
☒ other (specify) **Storm water outfalls**

13. If known, what is the approximate depth to the water table?

Approximately 4 feet or less

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface ☐ groundwater ☒ sewer ☐ collection impoundment

Cooper River and drainage ditches.

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No
16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: **comprises eastern border**) ☐ No
17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
Yes - Previous week brought Charleston its worst flood since a Hurricane Hugo (1989).
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
No, species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions).
19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*
See Draft EIS September 1994.
20. Weather conditions at the time this checklist was prepared.
DATE: **10-17-94**
70° F Temperature (°C/°F) NA Normally daily high temperature
NA Wind (Direction/Speed) No Precipitation (rain, snow)
Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

- **The entire DRMO area is a secured area, surrounded by fence and barbed wire. At the southeastern edge of the area, water was observed overflowing from a small manhole, likely due to the recent flooding.**
- **Off Navy property to the west of ESA I, a large emergent wetland is upstream from Noisette Creek.**
- **An approximately four acre open area, covered with grass and a few trees, is between Avenue D and the west boundary of ESA I. Railroad tracks run parallel to the west boundary.**
- **An isolated palustrine wetland is located downstream from the laydown yards near Bldg. 1648. Yards contain old refrigerators, tires, metal objects, pipe fittings (new), grocery carts.**

- An above ground sewer pipe was observed traversing the off site marshland, going underground once it crossed base boundary and was headed toward DRMO area (discharge to Cooper?).

Completed by: **FKS, MAB, GLT, JRC**

Additional Preparers: _____

DATE: 10/17/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (**<1%/.01 acres**). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.
3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed)
Provide a photograph, if available.
Dominant plant, if known: **Oak**
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☐ 0-6 in. ☐ 6-12in. ☐ 12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.
Lawn

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (**2 % 3 acres**). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
Area bordering Cooper River and isolated wetland, according to visual information.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☒ 2-5 ft. ☐ >5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☐ dense ☒ patchy ☐ sparse

II.C. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☒ old field ☐ other (specify
2. What percentage of the site is open field? (1 % 1.5 acres). Indicate the open fields on the site map.
3. What is/are the dominant plant(s)? Provide a photograph, if available.
Cattails
4. What is the approximate average height of the dominant plant? **6'**
5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

II.D. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☒ Yes
☐ No If yes, identify and describe them below.
Parking areas
2. Typical terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?
☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)
Unsure about origin of isolated wetland (See Section V) May be result of drainage lines.
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? acre(s)
Approximately 1 acre
5. Is any aquatic vegetation present? ☐ Yes ☒ No If yes, please identify the type of vegetation present (if known).
☐ emergent ☐ submergent ☐ floating
6. If known, what is the depth of the water?
< 3' in channel
7. What is the general composition of the substrate? Check all that apply.
☐ Bedrock ☐ Sand (coarse) ☐ Muck (fine/black)
☐ Boulder (.10 in.) ☐ Silt (fine) ☐ Debris
☐ Cobble (2.5-10 in.) ☐ Marl (shells) ☐ Detritus
☐ Gravel (0.1-2.5 in.) ☐ Clay (slick) ☐ Concrete
☐ Other (specify) ☒ Unknown
8. What is the source of water in the waterbody?
☐ River/stream/creek ☐ Groundwater ☐ Industrial discharge
☒ Surface runoff ☒ Other (specify) **Drainage lines**
9. Is there a discharge from the site to the waterbody? ☒ Yes ☐ No If yes, please describe this discharge and its path.
10. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.
- | | | | |
|--|----------------------------------|--|-------------------------|
| <input checked="" type="checkbox"/> River/stream/creek | <input type="checkbox"/> on-site | <input checked="" type="checkbox"/> off-site | Distance
650' |
| <input type="checkbox"/> Groundwater | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | |
| <input type="checkbox"/> Wetland | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | Distance |
| <input type="checkbox"/> Impoundment | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | |
11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:
- NA Area
- NA Depth (average)
- NA Temperature (depth of water at which the reading was taken)
- NA pH
- NA Dissolved oxygen
- NA Salinity
- NA Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
- NA Other (specify)

12. Describe observed color and area of coloration.
None observed
13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.
See Zone J Site Map
14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.? **None made**

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is(are) present at the site?
- | | | |
|---|--|-------------------------------------|
| <input type="checkbox"/> River | <input type="checkbox"/> Stream | <input type="checkbox"/> Creek |
| <input type="checkbox"/> Dry wash | <input type="checkbox"/> Arroyo | <input type="checkbox"/> Brook |
| <input type="checkbox"/> Man-Made (ditch, etc.) | <input type="checkbox"/> Intermittent Stream | <input type="checkbox"/> Channeling |
| <input type="checkbox"/> Other (specify) | | |
2. If known, what is the name of the waterbody?
3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?
☐ Yes ☐ No If yes, please describe indicators that were observed.
4. What is the general composition of the substrate? Check all that apply.
- | | | |
|---|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (.10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) | | |
5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?
6. Is the system influenced by tides? ☐ Yes ☐ No What information was used to make this determination?
7. Is the flow intermittent? ☐ Yes ☐ No If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the water body? ☐ Yes ☐ No If yes, please describe the discharge and its path.
9. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.
10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:
- ___ Width (ft.)
- ___ Depth (ft.)
- ___ Velocity (specify units:)
- ___ Temperature (depth of the water at which the reading was taken).
- ___ pH
- ___ Dissolved oxygen
- ___ Salinity
- ___ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
- ___ Other (specify)
11. Describe observed color and area of coloration.
12. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present if known.
- ☐ emergent ☐ Submergent ☐ floating
13. Mark the flowing water system on the attached site map.
14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

DEIS report and visual observation for wetland north of Bldg. 1648.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and the site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected?
☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.
3. What type(s) of vegetation are present in the wetland?
☐ Submergent ☒ Emergent ☐ Other (specify)
☒ Scrub/Shrub ☒ Wooded
4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.
Approximately 20' trees, cattails, 1-8' bald cypress trees, goldenrod
5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☒ Fresh ☐ Brackish
What is the approximate area of the water (sq.ft.)? ____
Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat - Non-Flowing Systems.
6. Is there evidence of flooding at the site? What observations were noted?
☐ Buttressing ☐ Water marks ☐ Mud cracks ☒ Debris line
☒ Other (describe below)
Interview with DRMO employee at Bldg. 1648 indicates flooding occurs after heavy rains, sometimes reaching beneath the fence surrounding Bldg. 1648, approx. 90 feet to the south of the wetland.
7. If known, what is the source of the water in the wetland?
☐ Stream/River/Creek/Lake/Pond ☐ Groundwater
☒ Flooding ☒ Surface Runoff
8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.
Laydown yards may contaminate surface water runoff that is captured by wetland.
9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?
☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine
10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.
Color (blue/gray, brown, black, mottled) **N/A**
Water content (dry, wet, saturated/unsaturated) **N/A**
11. Mark the observed wetland area(s) on the attached site map.
See Zone J Site Map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT

I. SITE DESCRIPTION

Date: October 18, 1994

1. Site Name: **ESA II — Noisette Creek/Golf Course/Officer Housing**

Location: **Northern Portion of Base**

Naval Base Charleston

County: **Charleston**

City: **Charleston**

State: **South Carolina**

2. Latitude: _____

Longitude: _____

3. What is the approximate area of the site? **150 acres**

4. Is this the first site visit? ☒ Yes ☐ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): (See Discussion in Section IA)

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

See USGS 7.5 Minute Quadrangle for Charleston

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

See Final Reports/EBS Surveys

7. The land use on the site is:

The area surrounding the site is: (_____ mile radius)

____ % Urban

____ % Urban

____ % Rural

____ % Rural

55 % Residential

____ % Residential

____ % Industrial (☒ light ☐ heavy)

75 % Industrial (☒ light ☐ heavy)

____ % Agricultural

____ % Agricultural

(Crops: _____)

(Crops: _____)

____ % Recreational

25 % Recreational

(Describe: note if it is a park, etc.)

Golf Course

(Describe: note if it is a park, etc.)

E — Cooper River; S — Industrialized Area; N — DRMO;

W — Railroad yard

____ % Undisturbed

25 % Undisturbed

____ % Other

____ % Other

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

☐ Agricultural Use ☒ Heavy Equipment ☐ Mining
☐ Natural Events ☒ Erosion ☐ Other

Please describe;

Soils are presumed to have been moved to construct golf course, housing. Erosion evident between Noisette Creek and golf course. Lift pump in area of standing water along Creek (near foot bridge) indicates frequent flooding.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes. Noisette Creek and associated fringe wetlands to north. A small pond in the northwest portion of ESA II is used as water hazard for golf course.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

National Wetland Inventory map; field observations

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal
☒ other (specify) **Golf course and residential (officer's housing)**

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? **Likely routing applications of pesticides and herbicides used in course maintenance.**

12. Check any potential routes of off-site migration of contaminants observed at the site:

☐ swales ☐ depressions ☒ drainage ditches
☒ runoff ☐ windblown particulates ☐ vehicular traffic
☒ other (specify) **Storm water outfalls**

13. If known, what is the approximate depth to the water table?

Approximately 4 feet or less

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface ☐ groundwater ☒ sewer ☐ collection impoundment

Cooper River and drainage ditches.

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No
Cooper River to the east and Noisette Creek to the north.
16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: Noisette Creek/small pond: comprises eastern border/on site) ☐ No
17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
Yes - Previous week brought Charleston its worst flood since a Hurricane Hugo (1989).
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
No, species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions).
19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service.* If species' identity is known please list them below.
See Draft EIS September 1994. Osprey (*Pandion haliaetus*) may frequent Noisette Creek.
20. Weather conditions at the time this checklist was prepared.
DATE: 10-18-94
70° F Temperature (°C/°F) Normally daily high temperature
Calm Wind (Direction/Speed) No Precipitation (rain, snow)
Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

- On 10/13/94, a visit to the Noisette Creek Footbridge revealed flood stage. Creek was overflowing onto Golf course and ponding in low lying areas (a pump was in one such area) upstream. Near the Railroad Trussel a drainage ditch which was emitting a cloudy white discharge into Noisette Creek. (See ASA III for details).
- Mullet/Menhaden were noticed jumping in general portions of Noisette Creek. Cormorants, heron were observed along this minor waterway as well.
- A small lake is present on golf course (south of Noisette Creek and 6th hole fairway.)

Completed by: FKS, MAB, GLT, JRC

Additional Preparers: _____

DATE: 10/18/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (25% 15 acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.
Officer's housing area has scattered stands of mature deciduous trees but is dominated by ornamental landscaping. Most of the trees were lost in Hurricane Hugo (1989).
3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available.
Dominant plant, if known: Live oak w/ pine, maple, and magnolia.
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☐ 0-6 in. ☐ 6-12in. ☒ > 12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.
Ornamental species within officer's housing area (some exotics) and young saplings along golf course fairways.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (1 % <1 acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
Along wetland/upland border.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.
Privet, laurels, and azaleas.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☒ 2-5 ft. ☐ > 5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☐ dense ☒ patchy ☐ sparse

II.C. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☐ old field ☒ other (specify) **Fairways**
2. What percentage of the site is open field? **(50 % TBD acres)**. Indicate the open fields on the site map.
3. What is/are the dominant plant(s)? Provide a photograph, if available.
Mowed grass with scattered trees and shrubs
4. What is the approximate average height of the dominant plant? **2 inches**
5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

II.D. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes
☒ No If yes, identify and describe them below.
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? **See discussion in Section IA.**
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?
☐ Natural (pond, lake)
☒ Man-made (lagoon, reservoir, canal, impoundment)
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
The name of the Golf course pond is unknown
3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?
Water hazard for golfers
4. What is the approximate size of the waterbody(s)? **0.5 acre(s)**

5. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present (if known).

☒ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? **Unknown**

7. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (.10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input checked="" type="checkbox"/> Other (specify) Unknown		

8. What is the source of water in the waterbody?

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> Groundwater	<input type="checkbox"/> Industrial discharge
<input checked="" type="checkbox"/> Surface runoff	<input type="checkbox"/> Other (specify)	

9. Is there a discharge from the site to the waterbody? ☒ Yes ☐ No If yes, please describe this discharge and its path. **Golf course pond likely receives runoff from fairways, etc.**

10. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input checked="" type="checkbox"/> River/stream/creek	<input checked="" type="checkbox"/> on-site	<input checked="" type="checkbox"/> off-site	Distance: To Noisette Creek and then to Cooper River (100 yards west)
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance: _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

NA Area
NA Depth (average)
NA Temperature (depth of water at which the reading was taken)
NA pH
NA Dissolved oxygen
NA Salinity
NA Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
NA Other (specify)

12. Describe observed color and area of coloration.
Brown/turbid; possibly due to recent heavy rain.
13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.
See Zone J/ESA maps
14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?
Fish (unidentified), tadpoles, heron, mockingbird, and a blue jay.

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is(are) present at the site?

<input type="checkbox"/> River	<input type="checkbox"/> Stream	<input checked="" type="checkbox"/> Creek
<input type="checkbox"/> Dry wash	<input type="checkbox"/> Arroyo	<input type="checkbox"/> Brook
<input type="checkbox"/> Man-Made (ditch, etc.)	<input type="checkbox"/> Intermittent Stream	<input type="checkbox"/> Channeling
<input type="checkbox"/> Other (specify)		
2. If known, what is the name of the waterbody?
Noisette Creek
3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?
☒ Yes ☐ No If yes, please describe indicators that were observed.
Floating debris (oil can), litter on bottom and along shorelines.
4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input checked="" type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input checked="" type="checkbox"/> Other (specify) Substrate not examined in detail, appeared silty with scattered rocks.		
5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?
Bank on south side was 2 to 3 feet above water and had retaining wall in eastern portion, , north shore had emergent and scrub shrub vegetation. Size of marginal wetland increased on north shore as it neared mouth to Cooper River.

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?
Obvious tidal flow and high water marks.
7. Is the flow intermittent? ☐ Yes ☒ No If yes, please note the information that was used in making this determination.
Flow observed at low and high tides was easterly to Cooper River.
8. Is there a discharge from the site to the water body? ☒ Yes ☐ No If yes, please describe the discharge and its path.
Lift pump present on golf course discharges into creek; several pipes were observed protruding from sea wall near mouth of creek.
9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is one site or off site.
Noisette Creek is a tributary to the Cooper River.
10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:
~90 Width (ft.)
NA Depth (ft.)
NA Velocity (specify units:)
NA Temperature (depth of the water at which the reading was taken).
NA pH
NA Dissolved oxygen
NA Salinity
s.t. Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
NA Other (specify)
11. Describe observed color and area of coloration.
Dark color, typical of estuarine water bodies
12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.
☒ emergent ☐ Submergent ☐ floating
13. Mark the flowing water system on the attached site map.
14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates. fish, birds, mammals, etc.?
Visual or auditory evidence of mullet or menhaden, double-crested cormorants, blue jays, mocking birds, great blue herons, mourning doves, wren sp., and racoon (feces).

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

National Wetland Inventory Map indicates estuarine emergent wetland in the intertidal zone.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and the site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected?
☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent ☒ Emergent ☐ Other (specify)
☒ Scrub/Shrub ☐ Wooded

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Small trees, scrub, smooth cordgrass, saltmeadow grass, and black needle rush.

5. Is standing water present? ☐ Yes ☒ No If yes, is this water: ☐ Fresh ☐ Brackish

What is the approximate area of the water (sq.ft.)? ____

Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat - Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

☐ Buttressing ☒ Water marks ☐ Mud cracks ☒ Debris line
☒ Other (describe below)

Flooding observed on golf course where creek spilled over banks.

7. If known, what is the source of the water in the wetland?

☒ Stream/River/Creek/Lake/Pond ☐ Groundwater
☐ Flooding ☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.

Wetlands at mouth and along north shore of creek receive runoff from golf course.

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

Water content (dry, wet, saturated/unsaturated) N/A

11. Mark the observed wetland area(s) on the attached site map.

See Zone J Site Map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo Dry gulch, brook or creek. A deep gully cut by an intermittent brook or stream.

Benthic Pertaining to the bottom of a waterbody.

Detritus Loose fragments or particles formed by the disintegration of rocks.

Marl A mixture of clays, carbonates of calcium and magnesium and remnants of shells.

Riparian Of, or on the bank of a natural course of water.

Secchi (disk) Basic measure of turbidity, visibility or transparency of water.

Submergent Vegetation Hidden, obscure vegetation which is inundated with water.

Swales Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT

I. SITE DESCRIPTION

Date: October 17, 1994

1. Site Name: **ESA III — North Industrial Area**
Location: **Includes Zones E, C, F, G (or portions thereof) in central part of base Naval Base Charleston**
County: **Charleston** City: **Charleston** State: **South Carolina**
2. Latitude: _____ Longitude: _____
3. What is the approximate area of the site? **500** acres
4. Is this the first site visit? ☒ Yes ☐ No If no, attach trip report of previous site visit(s) if available.
Date(s) of previous site visit(s): **(Some preliminary visits but not for ecological assessment)**
5. Please attach USGS topographic map(s) of the site to the checklist, if available.
See USGS 7.5 Minute Quadrangle for Charleston
6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.
See Final Reports/EBS Surveys
7. The land use on the site is: The area surrounding the site is: (____ mile radius)

____ % Urban	____ % Urban
____ % Rural	____ % Rural
<u>25</u> % Residential	<u>20</u> % Residential
<u>75</u> % Industrial (<input checked="" type="checkbox"/> light <input checked="" type="checkbox"/> heavy)	<u>45</u> % Industrial (<input checked="" type="checkbox"/> light <input type="checkbox"/> heavy)
____ % Agricultural	____ % Agricultural
(Crops: _____)	(Crops: _____)
____ % Recreational	____ % Recreational

(Describe: note if it is a park, etc.)

Heavily industrialized area, shipyards, drydocks **E — Cooper River; S — Southern Industrialized Area; N — Residential, golf course; W — Off site residents**

____ % Undisturbed	<u>35</u> % Undisturbed
____ % Other	____ % Other

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

☐ Agricultural Use ☒ Heavy Equipment ☐ Mining
☐ Natural Events ☐ Erosion ☒ Other

Please describe;

Dredge spoils have been used extensively as fill in this area.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

According to NWI map, Bldg. 910, the Detention Ponds on MacMillan Ave, are emergent wetlands.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

Draft EIS, National Wetland Inventory map; field observations

10. What type of facility is located at the site?

☐ chemical ☒ manufacturing ☐ mining ☒ waste disposal
☒ other (specify) **Various facilities (refer to Zone WPs that apply)**

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? **See Zone WPs.**

12. Check any potential routes of off-site migration of contaminants observed at the site:

☒ swales ☐ depressions ☒ drainage ditches
☒ runoff ☐ windblown particulates ☐ vehicular traffic
☒ other (specify) **Storm water outfalls**

13. If known, what is the approximate depth to the water table?

Approximately 4 feet or less

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface ☒ groundwater ☐ sewer ☒ collection impoundment
Cooper River, drainage ditches, detention ponds.

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

Cooper River to the east.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: Cooper River comprises eastern border) ☐ No
17. Is there evidence of flooding? ☐ Yes ☒ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
No, species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions).
19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*
See Draft EIS September 1994. During breeding season, Least Tern (*Sterna antillarum*) colonies have roosted on Bldg. 224 and Enlisted Club rooftops (Boyle, 1994). Osprey (*Pandion haliaetus*) may frequent Cooper River.
20. Weather conditions at the time this checklist was prepared.
DATE: 10-18/19-94
70° F Temperature (°C/°F) Normally daily high temperature
N/Calm Wind (Direction/Speed) No Precipitation (rain, snow)
Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

- ESA III was mostly paved with little sensitive ecological resources
- In the northern most extreme of ESA III, near the Ave D bridge crossing Noisette Creek, a cloudy white discharge was observed entering the creek near the railroad trussell. Source seems to originate from coal pile area but water in ditch (~50 yds) further upstream appeared clear. Further investigation is therefore recommended.
- Outfalls along Cooper River from ESA III were scoped out via boat on 10-19 (photos and map - see ESA VI).

Completed by: FKS, MAB, GLT, JRC

Additional Preparers: _____

DATE: 10/19/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (2 % TBD acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site. **Visual observation of patchy wooded areas west of Avenue D.**
3. What is the dominant type of vegetation in the wooded area? Evergreen **Deciduous** Mixed) Provide a photograph, if available.
Dominant plant, if known: **Ornamental**
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☐ 0-6 in. ☒ 6-12in. ☐ > .12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☒ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (___% ___ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a **photograph** if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☐ 2-5 ft. ☐ >5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☐ dense ☐ patchy ☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☐ old field ☒ other: **Ball fields**
2. What percentage of the site is open field? (4 % 150 acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.
Grassy area near Building 1803 (designated as "storage area" on base map).
4. What is the approximate average height of the dominant plant? **2 inches**
5. Describe the vegetation cover: ☐ dense ☒ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes
☒ No If yes, identify and describe them below.
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? **Ibis and heron species frequently feed in open grassy areas.**
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?
☐ Natural (pond, lake)
☒ Man-made (lagoon, reservoir, canal, impoundment)
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
Three retention basins in ESA III, two identified as "Bldg. 910 - Detention Ponds" on base map, one other unnamed.
3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?
Bldg. 910 collects stormwater from St. James Ave. storm drain and vicinity; The smaller unnamed basin is near oil storage tanks at western central Base boundary and is connected to off site marsh.
4. What is the approximate size of the waterbody(s)? **3.5 acre(s)**

5. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present (if known). **Cattails, arrow root, *Salix nigra*, *Juncus sp.***
☒ emergent ☒ submergent ☐ floating
6. If known, what is the depth of the water? **Presumed shallow**
7. What is the general composition of the substrate? Check all that apply.
☐ Bedrock ☐ Sand (coarse) ☐ Muck (fine/black)
☐ Boulder (.10 in.) ☐ Silt (fine) ☐ Debris
☐ Cobble (2.5-10 in.) ☐ Marl (shells) ☐ Detritus
☐ Gravel (0.1-2.5 in.) ☐ Clay (slick) ☐ Concrete
☒ Other (specify) **Unknown**
8. What is the source of water in the waterbody?
☐ River/stream/creek ☐ Groundwater ☐ Industrial discharge
☒ Surface runoff ☐ Other (specify)
9. Is there a discharge from the site to the waterbody? ☒ Yes ☐ No If yes, please describe this discharge and its path. **Designed to hold stormwater runoff from surrounding areas.**
10. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input checked="" type="checkbox"/> River/stream/creek	<input checked="" type="checkbox"/> on-site	<input checked="" type="checkbox"/> off-site	Distance: 3,000ft to Cooper River
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance: _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:
NA Area
NA Depth (average)
NA Temperature (depth of water at which the reading was taken)
NA pH
NA Dissolved oxygen
NA Salinity
NA Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
NA Other (specify)

12. Describe observed color and area of coloration.
Brown/turbid; possibly due to recent heavy rain.
13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.
See Zone J/ESA maps
14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?
Fish (unidentified) observed in ditch around Bldg. 1079.

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is(are) present at the site?
- | | | |
|--|--|--|
| <input type="checkbox"/> River | <input type="checkbox"/> Stream | <input type="checkbox"/> Creek |
| <input type="checkbox"/> Dry wash | <input type="checkbox"/> Arroyo | <input type="checkbox"/> Brook |
| <input checked="" type="checkbox"/> Man-Made (ditch, etc.) | <input type="checkbox"/> Intermittent Stream | <input checked="" type="checkbox"/> Channeling |
| <input type="checkbox"/> Other (specify) | | |
2. If known, what is the name of the waterbody? **Drainage ditches**
3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?
☒ Yes ☐ No If yes, please describe indicators that were observed.
Detention ponds have man-made banks and spillways.
4. What is the general composition of the substrate? Check all that apply.
- | | | |
|---|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input checked="" type="checkbox"/> Other (specify) Substrate not examined in detail, appeared silty with scattered rocks. | | |
5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?
Depths and widths vary. Detention ponds ~900 x 200 feet.
6. Is the system influenced by tides? ☐ Yes ☒ No What information was used to make this determination?
Visual observation.

7. Is the flow intermittent? ☒ Yes ☐ No If yes, please note the information that was used in making this determination.
Dependant upon rainfall amounts.
8. Is there a discharge from the site to the water body? ☒ Yes ☐ No If yes, please describe the discharge and its path. **Bldg. 910 discharges to Cooper River.**
9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is one site or off site.
See Section IA Summary.
10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:
~200 Width (ft.)
NA Depth (ft.)
NA Velocity (specify units:)
NA Temperature (depth of the water at which the reading was taken).
NA pH
NA Dissolved oxygen
NA Salinity
s.t. Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
NA Other (specify)
11. Describe observed color and area of coloration.
Dark color, typical of estuarine water bodies
12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.
☒ emergent ☒ Submergent ☐ floating
13. Mark the flowing water system on the attached site map.
14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates. fish, birds, mammals, etc.?
Small unidentified fish observed in ditch around Bldg. 1079.

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

Draft Environmental Impact Statement and NWI maps; Large detention ponds (Bldg 910) at St. Johns/McMillan Avenues are designated as palustine emergent wetlands. Two additional ponds are described in non-flowing section.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and the site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected?
☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?
☐ Submergent ☒ Emergent ☒ Other (specify) **Sedge and rush species**
☒ Scrub/Shrub ☐ Wooded

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☒ Fresh ☐ Brackish

What is the approximate area of the water (sq.ft.)? **TBD**

Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat - Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?
☐ Buttressing ☐ Water marks ☐ Mud cracks ☐ Debris line
☐ Other (describe below) **None**

7. If known, what is the source of the water in the wetland?
☐ Stream/River/Creek/Lake/Pond ☐ Groundwater
☐ Flooding ☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.
Possible offsite discharge to drainage ditches on west side of ESA III (along Ave. D).

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?
☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) **N/A**

Water content (dry, wet, saturated/unsaturated) **N/A**

11. Mark the observed wetland area(s) on the attached site map. **See Zone J Site Map.**

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT

I. SITE DESCRIPTION

Date: October 17, 1994

1. Site Name: **ESA IV — South Industrial Area**
Location: **Includes Zones G, H and I (or portions thereof) in south central part of base**
Naval Base Charleston
County: **Charleston** City: **Charleston** State: **South Carolina**
2. Latitude: _____ Longitude: _____
3. What is the approximate area of the site? **500 acres**
4. Is this the first site visit? ☒ Yes ☐ No If no, attach trip report of previous site visit(s) if available.
Date(s) of previous site visit(s): **(Some preliminary visits but not for ecological assessment)**
5. Please attach USGS topographic map(s) of the site to the checklist, if available.
See USGS 7.5 Minute Quadrangle for Charleston
6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.
See Final Reports/EBS Surveys
7. The land use on the site is:
____ % Urban
____ % Rural
15 % Residential
75 % Industrial (☒ light ☐ heavy)
____ % Agricultural
(Crops: _____)
10 % Recreational

(Describe: note if it is a park, etc.)
Moderately industrialized area, admin. buildings
____ % Undisturbed
____ % Other
- The area surrounding the site is: (____ mile radius)
____ % Urban
____ % Rural
20 % Residential
15 % Industrial (☒ light ☐ heavy)
____ % Agricultural
(Crops: _____)
____ % Recreational

(Describe: note if it is a park, etc.)
E — Cooper R.; S — ESA V; N — North Indust. Area; W — ESA V and offsite residents.
50 % Undisturbed
35 % Other Spoils Area

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

☐ Agricultural Use ☒ Heavy Equipment ☐ Mining
☐ Natural Events ☐ Erosion ☒ Other

Please describe;

Dredge spoils have been used extensively as fill in this area.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Southern tip of base is largely undeveloped.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

Draft EIS, National Wetland Inventory map; field observations

10. What type of facility is located at the site?

☐ chemical ☒ manufacturing ☐ mining ☒ waste disposal
☒ other (specify) **Various facilities; light industrial, (FISC) Refer to Zone WPs that apply.**

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? **ESA includes an asbestos site, potential POL contamination.**

12. Check any potential routes of off-site migration of contaminants observed at the site:

☒ swales ☐ depressions ☒ drainage ditches
☒ runoff ☐ windblown particulates ☐ vehicular traffic
☐ other (specify)

13. If known, what is the approximate depth to the water table?

Approximately 4 feet or less

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface ☐ groundwater ☒ sewer ☐ collection impoundment
Cooper River, drainage ditches.

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

Cooper River is to the east.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: Cooper River comprises portion of northern and eastern borders) ☐ No
See ESA VI Checklist
17. Is there evidence of flooding? ☐ Yes ☒ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
No, species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions).
19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*
See Draft EIS September 1994. During breeding season, least tern (*Sterna antillarum*) colonies have roosted on Bldg. 224 and Enlisted Club rooftops (Boyle, 1994). Osprey (*Pandion haliaetus*) and brown pelican may frequent Cooper River.
20. Weather conditions at the time this checklist was prepared.
DATE: 10-18-94
75° F Temperature (°C/°F) Normally daily high temperature
N/Calm Wind (Direction/Speed) No Precipitation (rain, snow)
Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

- A drainage ditch that contains emergent vegetation (cattails) is located across Dyess Avenue, west of Bldg. 1431 (~10' wide and 4' deep). Numerous grassy fields are present which may provide areas for white Ibis feeding areas, such as the area surrounding the Fire Fighting Training Area.
- Bldg 224 has palustrine scrub shrub vegetation to the west and north.
- Drainage ditches are located between Dyess Avenue and Bainbridge Ave. in this area. White residue was observed on grass and vegetation on banks of ditches (see photo).

Completed by: FKS, MAB, GLT, JRC

Additional Preparers: _____

DATE: 10/20/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (<1 % TBD acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site. **Visual observation.**
3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available. Dominant plant, if known: **TBD**
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☐ 0-6 in. ☒ 6-12in. ☐ > 12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (<2 % TBD acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
Mostly around Building 224, otherwise scattered ornamentals.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a **photograph** if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☒ 2-5 ft. ☐ > 5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☒ dense ☐ patchy ☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☐ old field ☒ other: **Ball fields**
2. What percentage of the site is open field? (<1 % __ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.
4. What is the approximate average height of the dominant plant? 2 inches
5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes
☒ No If yes, identify and describe them below.
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? Ibis and heron species frequently feed in open grassy areas. Brown pelican perched on pier.
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?
☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?
4. What is the approximate size of the waterbody(s)? ____ acre(s)
5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type (if known).
☐ emergent ☐ submergent ☐ floating
6. If known, what is the depth of the water?
7. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (.10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify)		
8. What is the source of water in the waterbody?
☐ River/stream/creek ☐ Groundwater ☐ Industrial discharge
☐ Surface runoff ☐ Other (specify)
9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.
10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance:
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance: _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:
- ___ Area
 - ___ Depth (average)
 - ___ Temperature (depth of water at which the reading was taken)
 - ___ pH
 - ___ Dissolved oxygen
 - ___ Salinity
 - ___ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
 - ___ Other (specify)
12. Describe observed color and area of coloration.
13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.
14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is(are) present at the site?
- | | | |
|--|--|-------------------------------------|
| <input type="checkbox"/> River | <input type="checkbox"/> Stream | <input type="checkbox"/> Creek |
| <input type="checkbox"/> Dry wash | <input type="checkbox"/> Arroyo | <input type="checkbox"/> Brook |
| <input checked="" type="checkbox"/> Man-Made (ditch, etc.) | <input type="checkbox"/> Intermittent Stream | <input type="checkbox"/> Channeling |
| <input type="checkbox"/> Other (specify) | | |
2. If known, what is the name of the waterbody? **Drainage ditches**
3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?
- ☐ Yes ☐ No If yes, please describe indicators that were observed.
4. What is the general composition of the substrate? Check all that apply.
- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input checked="" type="checkbox"/> Other (specify) Substrate not examined in detail. | | |

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?
TBD.
6. Is the system influenced by tides? ☐ Yes ☒ No What information was used to make this determination?
Unlikely.
7. Is the flow intermittent? ☒ Yes ☐ No If yes, please note the information that was used in making this determination. **Dependant upon rainfall amounts.**
8. Is there a discharge from the site to the water body? ☒ Yes ☐ No If yes, please describe the discharge and its path. **Ditches receive surface water runoff from various sites and ultimately discharge to Cooper River or Shipyard Creek.**
9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.
10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:
~2-5 Width (ft.)
~0.5-1 Depth (ft.)
NA Velocity (specify units:)
NA Temperature (depth of the water at which the reading was taken)
NA pH
NA Dissolved oxygen
NA Salinity
NA Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
residue Other (specify) Portion of ditch near Forest Sherman Rd. exhibited white residue.
11. Describe observed color and area of coloration.
Grass and vegetation around western ditches were coated with white residue.
12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.
☒ emergent ☒ Submergent ☐ floating
13. Mark the flowing water system on the attached site map.
14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.? **None noted during initial site visit.**

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

Draft Environmental Impact Statement and NWI maps; Area around Bldg. 224 is identified as a palustrine scrub-shrub wetland.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and the site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent ☒ Emergent
☒ Scrub/Shrub ☐ Wooded
☐ Other (specify)

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

5. Is standing water present? ☐ Yes ☒ No If yes, is this water: ☐ Fresh ☐ Brackish

What is the approximate area of the water (sq.ft.)? ____

Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat - Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

☐ Buttressing ☐ Water marks ☐ Mud cracks ☐ Debris line
☐ Other (describe below) No

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond ☐ Groundwater
☐ Flooding ☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.

Ditch out falls into Cooper River or Shipyard Creek.

9. Is there a discharge from the wetland? ☐ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

Water content (dry, wet, saturated/unsaturated) N/A

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (5 % TBD acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.
Located east of ballfields as per Draft EIS and visual observation.
3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available.
Dominant plant, if known: _____
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☒ 0-6 in. ☐ 6-12in. ☐ >12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (6 % TBD acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☐ 2-5 ft. ☒ >5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☒ dense ☐ patchy ☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☐ old field ☒ other: **Ball fields**
2. What percentage of the site is open field? (8 % TBD acres). Indicate the open fields on the site map.
3. What is/are the dominant plant(s)? Provide a photograph, if available.
Grass
4. What is the approximate average height of the dominant plant? 2 inches
5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes
☒ No If yes, identify and describe them below.
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? **Mosquitos abundant due to standing water, mullet observed jumping in Cooper, two dead northern pufferfish found on pier, large population of swallows, pelicans, gulls, cormorants. Interior of spoils area supports flock of sanderlings/sandpipers. Skunk also present.**
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?
☐ Natural (pond, lake)
☒ Man-made (lagoon, reservoir, canal, impoundment) **Spoils area will spillways**
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
Spoils area (occasionally inundated)

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: **Cooper River comprises portion of northern and eastern borders**) ☐ No
See ESA VI Checklist
17. Is there evidence of flooding? ☐ Yes ☒ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
No, species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions).
19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*
See Draft EIS September 1994. During breeding season, least tern (*Sterna antillarum*) colonies have roosted on Bldg. 224 and Enlisted Club rooftops (Boyle, 1994). Osprey (*Pandion haliaetus*) and brown pelican may frequent Cooper River.
20. Weather conditions at the time this checklist was prepared.
DATE: **10-18-94**
75° F Temperature (°C/°F) _____ Normally daily high temperature
N/Calm Wind (Direction/Speed) **No** Precipitation (rain, snow)
Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

- A drainage ditch that contains emergent vegetation (cattails) is located across Dyess Avenue, west of Bldg. 1431 (~10' wide and 4' deep). Numerous grassy fields are present which may provide areas for white Ibis feeding areas, such as the area surrounding the Fire Fighting Training Area.
- Bldg 224 has palustrine scrub shrub vegetation to the west and north.
- Drainage ditches are located between Dyess Avenue and Bainbridge Ave. in this area. White residue was observed on grass and vegetation on banks of ditches (see photo).

Completed by: **FKS, MAB, GLT, JRC**

Additional Preparers: _____

DATE: 10/20/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (<1 % TBD acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site. **Visual observation.**
3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available. Dominant plant, if known: **TBD**
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☐ 0-6 in. ☒ 6-12 in. ☐ >12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (<2 % TBD acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
Mostly around Building 224, otherwise scattered ornamentals.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☒ 2-5 ft. ☐ >5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☒ dense ☐ patchy ☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☐ old field ☒ other: **Ball fields**
2. What percentage of the site is open field? (<1 % __ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.
4. What is the approximate average height of the dominant plant? **2 inches**
5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes
☒ No If yes, identify and describe them below.
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? **Ibis and heron species frequently feed in open grassy areas. Brown pelican perched on pier.**
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (5 % TBD acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

Located east of ballfields as per Draft EIS and visual observation.

3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available.
Dominant plant, if known: _____
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☒ 0-6 in. ☐ 6-12in. ☐ > 12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (6 % TBD acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☐ 2-5 ft. ☒ > 5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☒ dense ☐ patchy ☐ sparse

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT

I. SITE DESCRIPTION

Date: October 18, 1994

1. Site Name: **ESA V — Southern End of Base**
Location: **Includes Zones H and I (or portions thereof)**
Naval Base Charleston
County: **Charleston** City: **Charleston** State: **South Carolina**
2. Latitude: _____ Longitude: _____
3. What is the approximate area of the site? **400 acres**
4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.
Date(s) of previous site visit(s): **(Some preliminary visits but not for ecological assessment)**
5. Please attach USGS topographic map(s) of the site to the checklist, if available.
See USGS 7.5 Minute Quadrangle for Charleston
6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.
See Final Reports/EBS Surveys

7. The land use on the site is:

The area surrounding the site is: (____ mile radius)

____ % Urban

____ % Urban

____ % Rural

____ % Rural

____ % Residential

____ % Residential

5 % Industrial (☒ light ☐ heavy)

50 % Industrial (☒ light ☐ heavy)

____ % Agricultural

____ % Agricultural

(Crops: _____)

(Crops: _____)

8 % Recreational

____ % Recreational

(Describe: note if it is a park, etc.)

(Describe: note if it is a park, etc.)

Marina, running track, few Bldgs.

E — Cooper R.; S — Shipyard Creek; MacCalloy, Denton Facilities; N — Southern Indust. Area; W — Offsite residents.

40 % Undisturbed Undeveloped

25 % Undisturbed

35 % Other: Dredge Spoils

50 % Other Cooper/Shipyard Rivers

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

____ Agricultural Use

X Heavy Equipment

____ Mining

____ Natural Events

____ Erosion

X Other

Please describe;

Dredge spoils have been used extensively as fill in this area. The southern portion of the base is dredge spoils. Active deposition occurs w/in diked area. Historic dike relocation projects during intermittent dredging periods (last in 1989).

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Southern tip of base is largely undeveloped. Wetland habitat is present throughout ESA V.

9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

Draft EIS, National Wetland Inventory map; field observations

10. What type of facility is located at the site?
☐ chemical ☐ manufacturing ☐ mining ☒ waste disposal
☒ other (specify) **Athletic fields, former waste disposal area (SWMU 20) and Landfill (SWMU 9). Refer to Zone WPs that apply.**
11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?
See Zone H and I WPs.
12. Check any potential routes of off-site migration of contaminants observed at the site:
☒ swales ☐ depressions ☒ drainage ditches
☒ runoff ☐ windblown particulates ☐ vehicular traffic
☒ other (specify): **Dewatering of spoils area, tidal fluctuations**
13. If known, what is the approximate depth to the water table?
Approximately 4 feet or less
14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.
☒ surface ☐ groundwater ☐ sewer ☐ collection impoundment
Cooper River.
15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No
Cooper River is to the east, Shipyard Creek to the south.
16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: **Cooper River comprises eastern border, Shipyard R. on the south**) ☐ No
See ESA VI, VII Checklists.
17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
No, species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions). Also refer to DEIS (Navy, 1994).

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

See Draft EIS September 1994. Sea purslane was identified in the vicinity of the spoils area. Some migrating waterfowl may utilize shelter provided by spoils area, as well.

20. Weather conditions at the time this checklist was prepared.

DATE: 10-18-94

75° F Temperature (°C/°F) Normally daily high temperature

N/Calm Wind (Direction/Speed) No Precipitation (rain, snow)

Clear Cloud cover

Completed by: FKS, MAB, GLT, JRC

Additional Preparers: _____

DATE: 10/20/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (5 % TBD acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.
Located east of ballfields as per Draft EIS and visual observation.
3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available.
Dominant plant, if known: _____
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☒ 0-6 in. ☐ 6-12 in. ☐ >12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (6 % TBD acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☐ 2-5 ft. ☒ >5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☒ dense ☐ patchy ☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☐ old field ☒ other: **Ball fields**
2. What percentage of the site is open field? (**8 % TBD acres**). Indicate the open fields on the site map.
3. What is/are the dominant plant(s)? Provide a photograph, if available.
Grass
4. What is the approximate average height of the dominant plant? **2 inches**
5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes
☒ No If yes, identify and describe them below.
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.? **Mosquitos abundant due to standing water, mullet observed jumping in Cooper, two dead northern pufferfish found on pier, large population of swallows, pelicans, gulls, cormorants. Interior of spoils area supports flock of sanderlings/sandpipers. Skunk also present.**
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?
☐ Natural (pond, lake)
☒ Man-made (lagoon, reservoir, canal, impoundment) **Spoils area will spillways**
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
Spoils area (occasionally inundated)

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

Dewatering of dredged sediments

4. What is the approximate size of the waterbody(s)? **20** acre(s)

5. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type (if known).

☒ emergent

☐ submergent

☐ floating

6. If known, what is the depth of the water? **2-5 feet in spoils area (estimated), may vary depending on activity.**

7. What is the general composition of the substrate? Check all that apply.

☐ Bedrock

☐ Sand (coarse)

☒ Muck (fine/black)

☐ Boulder (.10 in.)

☒ Silt (fine)

☐ Debris

☐ Cobble (2.5-10 in.)

☐ Marl (shells)

☐ Detritus

☐ Gravel (0.1-2.5 in.)

☐ Clay (slick)

☐ Concrete

☐ Other (specify)

8. What is the source of water in the waterbody?

☐ River/stream/creek

☐ Groundwater

☐ Industrial discharge

☐ Surface runoff

☒ Other (specify): **Dredge slurry**

9. Is there a discharge from the site to the waterbody? ☐ Yes ☒ No If yes, please describe this discharge and its path. **Discharge to the waterbody is dredged from river sediments.**

10. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

☒ River/stream/creek

☐ on-site

☒ off-site

Distance: **200-300 ft.**

☐ Groundwater

☐ on-site

☐ off-site

☒ Wetland

☒ on-site

☐ off-site

Distance: **Fringe wetlands; same as above.**

☐ Impoundment

☐ on-site

☐ off-site

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

NA Area

NA Depth (average)

NA Temperature (depth of water at which the reading was taken)

NA pH

NA Dissolved oxygen

NA Salinity

NA Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)

NA Other (specify)

12. Describe observed color and area of coloration.

Water was brown, turbid.

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

See map.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

Sanderlings, heron, duck (Teal)

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is(are) present at the site?

☐ River

☒ Stream

☐ Creek

☐ Dry wash

☐ Arroyo

☐ Brook

☒ Man-Made (ditch, etc.) ☐ Intermittent Stream

☐ Channeling

☐ Other (specify)

2. If known, what is the name of the waterbody?

Headwaters of Shipyard River, various drainage ditches

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?

☒ Yes ☐ No If yes, please describe indicators that were observed.

Extensive fill activities; debris and lumber from past construction of perimeter fence is present. A former dumpsite was located to the east of headwaters, west of Least Tern Lane.

4. What is the general composition of the substrate? Check all that apply.

☐ Bedrock ☐ Sand (coarse) ☒ Muck (fine/black)
☐ Boulder (> 10 in.) ☒ Silt (fine) ☒ Debris
☐ Cobble (2.5-10 in.) ☐ Marl (shells) ☐ Detritus
☐ Gravel (0.1-2.5 in.) ☐ Clay (slick) ☒ Concrete
☒ Other (specify) **Substrate not examined in detail.**

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

Distinct channeling of Shipyard Creek visible at low tide.

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?

Field observations at both high and low tide.

7. Is the flow intermittent? ☐ Yes ☒ No If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the water body? ☒ Yes ☐ No If yes, please describe the discharge and its path.

Headwaters receive surface water runoff from various sites and ultimately discharge to Cooper River.

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

During high tide, extensive inundation of inland areas southwest of running track.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

NA Width (ft.)

NA Depth (ft.)

NA Velocity (specify units:)

NA Temperature (depth of the water at which the reading was taken).

NA pH

NA Dissolved oxygen

NA Salinity

NA Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)

 Other (specify)

11. Describe observed color and area of coloration.
Brownish, turbid.
12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.
☒ emergent ☐ submergent ☐ floating
13. Mark the flowing water system on the attached site map.
14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?
During recent sediment sampling events, no benthic organisms were in the 0 to 6-inch interval. Abundant fiddler crab population. No benthic samples collected.

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

Draft Environmental Impact Statement and NWI maps.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and the site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected?
☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.
3. What type(s) of vegetation are present in the wetland?
☐ Submergent ☒ Emergent
☒ Scrub/Shrub ☒ Wooded
☐ Other (specify)
4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.
Both EEW and PWs along West Road and west of waste disposal area. Drainage ditches along roadsides.
5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☐ Fresh ☒ Brackish
What is the approximate area of the water (sq.ft.)? **~50% of ESA V has standing water during high tide.**

Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat - Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

☐ Buttreassing ☒ Water marks ☒ Mud cracks ☐ Debris line
☐ Other (describe below)

7. If known, what is the source of the water in the wetland?

☒ Stream/River/Creek/Lake/Pond ☐ Groundwater
☐ Flooding ☐ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.
Tidal and surface water runoff

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

Water content (dry, wet, saturated/unsaturated) N/A

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT

I. SITE DESCRIPTION

Date: October 18, 1994

1. Site Name: **ESA VI — Cooper River**

Location: **Eastern border**

Naval Base Charleston

County: **Charleston**

City: **Charleston**

State: **South Carolina**

2. Latitude: _____

Longitude: _____

3. What is the approximate area of the site? **Area of river adjacent to naval base is ~ 1,500 to 3,000 feet wide and 45,000 feet long.**

4. Is this the first site visit? ☒ Yes ☐ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s):

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

See USGS 7.5 Minute Quadrangle for Charleston

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section. **See Final Reports/EBS Surveys**

7. The land use on the site is:

The area surrounding the site is: (____ mile radius)

____ % Urban

____ % Urban

____ % Rural

____ % Rural

____ % Residential

____ % Residential

____ % Industrial (☐ light ☐ heavy)

50 % Industrial (☒ light ☒ heavy)

____ % Agricultural

____ % Agricultural

(Crops: _____)

(Crops: _____)

____ % Recreational

1 % Recreational

(Describe: note if it is a park, etc.)

(Describe: note if it is a park, etc.)

River

E — Clouter Island; S — Charleston Harbor; N — Upriver;

W — Naval Base.

100 % Undisturbed Open water

50 % Undisturbed

____ % Other:

____ % Other

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

☐ Agricultural Use

☒ Heavy Equipment

☐ Mining

☐ Natural Events

☐ Erosion

☒ Other

Please describe;

Routine dredging along main channel and in pier areas.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes, wetland habitats are present along portions of both shorelines.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

Draft EIS, National Wetland Inventory map; field observations

10. What type of facility is located at the site?

☐ chemical

☐ manufacturing

☐ mining

☐ waste disposal

☒ other (specify) **ESA VI is a major river.**

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? **Possible antifouling paints, UXO, point source discharges.**

12. Check any potential routes of off-site migration of contaminants observed at the site:

☒ swales

☐ depressions

☒ drainage ditches

☒ runoff

☐ windblown particulates

☐ vehicular traffic

☒ other (specify): **Ship traffic, current.**

13. If known, what is the approximate depth to the water table?

Surface water averages 14 in shallows to 45 feet in channel.

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface

☐ groundwater

☐ sewer

☐ collection impoundment

Cooper River.

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No

ESA VI is the Cooper River, which is a navigable waterbody.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: site) ☐ No
17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
Species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions). Only vegetation observed was mass of floating aquatic plant (approx. 10 sq. ft.) in center of River just south of I-526 bridge. Shrimp carcasses were observed on pair railings at marina, apparently caught by bird. Mullet observed jumping in Cooper, two dead northern pufferfish found on pier, large population of pelicans, gulls, cormorants.
19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*
See Draft EIS, September 1994.
20. Weather conditions at the time this checklist was prepared.
 DATE: **10-19-94**
78-80° F Temperature (°C/°F) Normally daily high temperature
N/Calm Wind (Direction/Speed) No Precipitation (rain, snow)
Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

Completed by: **FKS, MAB, GLT, JRC**

Additional Preparers:

DATE: 10/20/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ Yes ☒ No If no, go to Section B: Shrub/Scrub.

2. What percentage or area of the site is wooded? (___% ___ acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.
3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available.
Dominant plant, if known: _____
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☐ 0-6 in. ☐ 6-12in. ☐ >12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☒ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (___% ___ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☐ 2-5 ft. ☐ >5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☐ dense ☐ patchy ☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ Yes ☒ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☐ old field ☐ other:
2. What percentage of the site is open field? (___% ___ acres). Indicate the open fields on the site map.
3. What is/are the dominant plant(s)? Provide a photograph, if available.
4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: ☐ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes
☒ No If yes, identify and describe them below.
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site? **None**
☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?
4. What is the approximate size of the waterbody(s)? ____ acre(s)
5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type (if known).
☐ emergent ☐ submergent ☐ floating
6. If known, what is the depth of the water?
7. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (.10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify)		

8. What is the source of water in the waterbody?
- ☐ River/stream/creek ☐ Groundwater ☐ Industrial discharge
- ☐ Surface runoff ☐ Other (specify):
9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.
10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.
- | | | | |
|---|----------------------------------|-----------------------------------|-----------|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | Distance: |
| <input type="checkbox"/> Groundwater | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | |
| <input type="checkbox"/> Wetland | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | Distance: |
| <input type="checkbox"/> Impoundment | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | |
11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:
- ___ Area
- ___ Depth (average)
- ___ Temperature (depth of water at which the reading was taken)
- ___ pH
- ___ Dissolved oxygen
- ___ Salinity
- ___ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
- ___ Other (specify)
12. Describe observed color and area of coloration.
13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.
14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is(are) present at the site?
- | | | | |
|---|--|-------------------------------------|--|
| <input checked="" type="checkbox"/> River | <input type="checkbox"/> Stream | <input type="checkbox"/> Creek | <input type="checkbox"/> Other (specify) |
| <input type="checkbox"/> Dry wash | <input type="checkbox"/> Arroyo | <input type="checkbox"/> Brook | |
| <input type="checkbox"/> Man-Made (ditch, etc.) | <input type="checkbox"/> Intermittent Stream | <input type="checkbox"/> Channeling | |

2. If known, what is the name of the waterbody? **Cooper River**

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?
☒ Yes ☐ No If yes, please describe indicators that were observed.
Routine dredging activities to maintain project depth in centerline channel (42 feet).

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete

☒ Other (specify) **Substrate not examined in detail.**

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?
West bank along base property consists of large cement piers, rip rap, with portions of fringe wetland.
Bank at Clouter Island is narrow sandy beach or fringe wetland.

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?
Field observations at both high and low tide/tide charts/naval personnel.

7. Is the flow intermittent? ☐ Yes ☒ No If yes, please note the information that was used in making this determination. **Observations.**

8. Is there a discharge from the site to the water body? ☐ Yes ☒ No If yes, please describe the discharge and its path. **NA**

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.
Cooper River discharges into Charleston Harbor and the Atlantic Ocean.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:
2,000 Width (ft.)
42 Depth (ft.)
NA Velocity (specify units:)
NA Temperature (depth of the water at which the reading was taken)
NA pH
NA Dissolved oxygen
NA Salinity
Turbid Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
NA Other (specify)

11. Describe observed color and area of coloration. **Brownish, turbid.**
12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.
☒ emergent ☐ submergent ☐ floating
13. Mark the flowing water system on the attached site map.
Located just South of I-526 Bridge.
14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?
No benthic samples collected; pufferfish, mullet, shrimp; pelicans, gulls, and cormorants.

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

Draft Environmental Impact Statement and NWI maps.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and the site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected?
☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.
3. What type(s) of vegetation are present in the wetland?
☐ Submergent ☒ Emergent
☒ Scrub/Shrub ☒ Wooded
☐ Other (specify)
4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.
Both EEW and PWs along southeast shoreline and at mouth of Noisette Creek.
5. Is standing water present? ☐ Yes ☒ No If yes, is this water: ☐ Fresh ☐ Brackish
What is the approximate area of the water (sq.ft.)?
Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat - Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?
- ☐ Buttreassing ☒ Water marks ☐ Mud cracks ☒ Debris line
- ☐ Other (describe below)
7. If known, what is the source of the water in the wetland?
- ☒ Stream/River/Creek/Lake/Pond ☐ Groundwater
- ☐ Flooding ☐ Surface Runoff
8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.
- Tidal fluctuation and surface water runoff**
9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?
- ☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine
10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.
- Color (blue/gray, brown, black, mettled) N/A
- Water content (dry, wet, saturated/unsaturated) N/A
11. Mark the observed wetland area(s) on the attached site map.
- See Zone J ESA Map Figure 1.**

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT

I. SITE DESCRIPTION

Date: October 18, 1994

1. Site Name: **ESA VII — Shipyard River**

Location: **Southwest border**

Naval Base Charleston

County: **Charleston**

City: **Charleston**

State: **South Carolina**

2. Latitude: _____

Longitude: _____

3. What is the approximate area of the site? **Area of river adjacent to naval base is ~ 1,000 feet wide and 5,000 feet long.**

4. Is this the first site visit? ☒ Yes ☐ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s):

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

See USGS 7.5 Minute Quadrangle for Charleston

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

See Final Reports/EBS Surveys

7. The land use on the site is:

____ % Urban

____ % Rural

____ % Residential

____ % Industrial (☐ light ☐ heavy)

____ % Agricultural

(Crops: _____)

____ % Recreational

(Describe: note if it is a park, etc.)

River

The area surrounding the site is: (____ mile radius)

____ % Urban

____ % Rural

____ % Residential

20 % Industrial (☒ light ☐ heavy)

____ % Agricultural

(Crops: _____)

1 % Recreational

(Describe: note if it is a park, etc.)

E — Naval Base; S — Cooper River; N — Naval Base, MacCalloy Plant; W — Denton Shipyard.

100 % Undisturbed Open water

____ % Other:

50 % Undisturbed

____ % Other

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

☐ Agricultural Use

☒ Heavy Equipment

☐ Mining

☐ Natural Events

☐ Erosion

☒ Other

Please describe;

Routine dredging along main channel.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes, wetland habitats are present along portions of both shorelines.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

Draft EIS, National Wetland Inventory map; field observations

10. What type of facility is located at the site?

☐ chemical

☐ manufacturing

☐ mining

☐ waste disposal

☒ other (specify) **ESA VII is a tributary to the Cooper River.**

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Possible antifouling paints and discharges (Denton, MacCalloy); dewatering of spoils area.

12. Check any potential routes of off-site migration of contaminants observed at the site:

☒ swales

☐ depressions

☒ drainage ditches

☒ runoff

☐ windblown particulates

☐ vehicular traffic

☒ other (specify): **Ship traffic, current.**

13. If known, what is the approximate depth to the water table?

Surface water averages 14 feet in channel.

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface

☐ groundwater

☐ sewer

☐ collection impoundment

Cooper River.

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No

Shipyard River is a tributary to the Cooper River, a navigable waterbody.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: site) ☐ No
17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
Species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions).
19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service.* If species' identity is known please list them below.
See Draft EIS, September 1994.
20. Weather conditions at the time this checklist was prepared.
 DATE: **10-19-94**
78-80° F Temperature (°C/°F) NA Normally daily high temperature
N/Calm Wind (Direction/Speed) No Precipitation (rain, snow)
Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

Completed by: **FKS, MAB, GLT, JRC**

Additional Preparers: _____

DATE: 10/20/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ Yes ☒ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (___% ___ acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available.
Dominant plant, if known: _____
4. What is the predominant size of the trees at the site? Use diameter at breast height.
☐ 0-6 in. ☐ 6-12 in. ☐ > 12 in.
5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☒ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? (___% ___ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.
3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.
4. What is the approximate average height of the scrub/shrub vegetation?
☐ 0-2 ft. ☐ 2-5 ft. ☐ > 5 ft.
5. Based on site observations, how dense is the scrub/shrub vegetation?
☐ dense ☐ patchy ☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ Yes ☒ No If yes, please indicate the type below:
☐ prairie/plains ☐ savannah ☐ old field ☐ other:
2. What percentage of the site is open field? (___% ___ acres). Indicate the open fields on the site map.
3. What is/are the dominant plant(s)? Provide a photograph, if available.
4. What is the approximate average height of the dominant plant? _____
5. Describe the vegetation cover: ☐ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes
☒ No If yes, identify and describe them below.
2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site? None
☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?
4. What is the approximate size of the waterbody(s)? ____ acre(s)
5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type (if known).
☐ emergent ☐ submergent ☐ floating
6. If known, what is the depth of the water?
7. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (.10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify)		

8. What is the source of water in the waterbody?
- ☐ River/stream/creek ☐ Groundwater ☐ Industrial discharge
- ☐ Surface runoff ☐ Other (specify):
9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.
10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.
- | | | | |
|---|----------------------------------|-----------------------------------|-----------|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | Distance: |
| <input type="checkbox"/> Groundwater | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | |
| <input type="checkbox"/> Wetland | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | Distance: |
| <input type="checkbox"/> Impoundment | <input type="checkbox"/> on-site | <input type="checkbox"/> off-site | |
11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:
- ___ Area
- ___ Depth (average)
- ___ Temperature (depth of water at which the reading was taken)
- ___ pH
- ___ Dissolved oxygen
- ___ Salinity
- ___ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)
- ___ Other (specify)
12. Describe observed color and area of coloration.
13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.
14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is(are) present at the site?

<input checked="" type="checkbox"/> River	<input type="checkbox"/> Stream	<input type="checkbox"/> Creek
<input type="checkbox"/> Dry wash	<input type="checkbox"/> Arroyo	<input type="checkbox"/> Brook
<input type="checkbox"/> Man-Made (ditch, etc.)	<input type="checkbox"/> Intermittent Stream	<input type="checkbox"/> Channeling
<input type="checkbox"/> Other (specify)		

2. If known, what is the name of the waterbody? **Shipyard River**

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?

☒ Yes ☐ No If yes, please describe indicators that were observed.

Occasional dredging activities to maintain project depth.

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input checked="" type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input checked="" type="checkbox"/> Other (specify) Substrate not examined in detail.		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

East bank along base property consists of fringe wetland. West bank has several large piers (Denton Shipyard with portions of fringe wetland.

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?

Field observations at both high and low tide/tide charts/naval personnel.

7. Is the flow intermittent? ☐ Yes ☒ No If yes, please note the information that was used in making this determination. **Field observations.**

8. Is there a discharge from the site to the water body? ☒ Yes ☐ No If yes, please describe the discharge and its path. **Cooper River.**

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

Cooper River discharges into the Charleston Harbor and the Atlantic Ocean.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

2,000 Width (ft.)

14 Depth (ft.)

NA Velocity (specify units:)

NA Temperature (depth of the water at which the reading was taken).

NA pH

NA Dissolved oxygen

NA Salinity

Turbid Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)

NA Other (specify)

11. Describe observed color and area of coloration.

Brownish, turbid.

12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.

☒ emergent

☐ submergent

☒ floating

13. Mark the flowing water system on the attached site map.

See Zone J, Figure 1.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

Field observations made during sediment chemical sampling in upper reaches of Shipyard River (Zone H investigation) revealed no visible benthic organisms in the upper 6 inches. Mullet, pelicans, gulls, and cormorants, osprey were observed.

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

Draft Environmental Impact Statement and NWI maps.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and the site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected?

☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?
- ☐ Submergent ☒ Emergent
☒ Scrub/Shrub ☐ Wooded
☐ Other (specify)
4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.
Both EEW and PWs along shorelines.
5. Is standing water present? ☐ Yes ☒ No If yes, is this water: ☐ Fresh ☐ Brackish
What is the approximate area of the water (sq.ft.)?
Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat - Non-Flowing Systems.
6. Is there evidence of flooding at the site? What observations were noted?
- ☐ Buttrressing ☒ Water marks ☐ Mud cracks ☒ Debris line
☐ Other (describe below)
7. If known, what is the source of the water in the wetland?
- ☒ Stream/River/Creek/Lake/Pond ☐ Groundwater
☐ Flooding ☐ Surface Runoff
8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.
Tidal fluctuation and surface water runoff
9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?
- ☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine
10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.
Color (blue/gray, brown, black, mettled) N/A
Water content (dry, wet, saturated/unsaturated) N/A
11. Mark the observed wetland area(s) on the attached site map.
See Zone J, Figure 1.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT

I. SITE DESCRIPTION

Date: October 18, 1994

1. Site Name: **ESA VIII — Clouter Island**
Location: **Across Cooper River to the East**
Naval Base Charleston
County: **Berkely** City: **Charleston** State: **South Carolina**
2. Latitude: _____ Longitude: _____
3. What is the approximate area of the site? **1,397 acres**
4. Is this the first site visit? ☒ Yes ☐ No If no, attach trip report of previous site visit(s) if available.
Date(s) of previous site visit(s):
5. Please attach USGS topographic map(s) of the site to the checklist, if available.
See USGS 7.5 Minute Quadrangle for Charleston
6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.
See Final Reports/EBS Surveys
7. The land use on the site is: The area surrounding the site is: (____ mile radius)

____ % Urban	____ % Urban
____ % Rural	____ % Rural
____ % Residential	____ % Residential
<u>2</u> % Industrial (<input checked="" type="checkbox"/> light <input type="checkbox"/> heavy)	<u>50</u> % Industrial (<input checked="" type="checkbox"/> light <input type="checkbox"/> heavy)
____ % Agricultural	____ % Agricultural
(Crops: _____)	(Crops: _____)
____ % Recreational	____ % Recreational

(Describe: note if it is a park, etc.) (Describe: note if it is a park, etc.)

E — Clouter Creek; S — Cooper R.; N — Cooper River; W — Cooper River.

10 % Undisturbed Undeveloped ____ % Undisturbed
88 % Other: Dredge Spoils ____ % Other Cooper/Shipyard Rivers

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

☐ Agricultural Use

☒ Heavy Equipment

☐ Mining

☐ Natural Events

☐ Erosion

☒ Other

Please describe;

Dredge spoils have been used extensively as fill in this area. Island is dredge spoils. Active deposition occurs within diked area.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Wetland conditions may be present throughout ESA VIII.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

Draft EIS, National Wetland Inventory map; field observations

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) **Spoils area, former Fuse Supply Building.**

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels? **Unknown.**

12. Check any potential routes of off-site migration of contaminants observed at the site:

☒ swales ☐ depressions ☒ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☒ other (specify): **Dewatering outfalls of spoils area, tidal fluctuations**

13. If known, what is the approximate depth to the water table? **NA**

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface ☐ groundwater ☐ sewer ☐ collection impoundment

Cooper River, Clouter Creek.

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist - Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist - Flowing Systems.
☒ Yes (approx. distance: **Cooper River comprises western border, Clouter Creek on the east**) ☐ No
17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.
Interior of diked area is routinely flooded with dredge slurry.
18. If a field guide was used to aid any of the identifications, please provide a reference. also, estimate the time spent identifying fauna. {Use the back of this page if additional space for text is needed.}
No, species identification will be further addressed as necessary (Navy Draft EIS provided adequate site descriptions).
19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes
☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*
See Draft EIS September 1994. Sea purslane was identified in the vicinity of the spoils area at southern end of base.
20. Weather conditions at the time this checklist was prepared.
DATE: **10-19-94**
75° F Temperature (°C/°F) **NA** Normally daily high temperature
N/Calm Wind (Direction/Speed) **No** Precipitation (rain, snow)
Clear Cloud cover

Completed by: **FKS, MAB, GLT, JRC**

Additional Preparers: _____

DATE: 10/20/94

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? (**30 % TBD acres**). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.
Draft EIS and visual observation.

3. What is the dominant type of vegetation in the wooded area? Evergreen Deciduous Mixed) Provide a photograph, if available.

Dominant plant, if known: _____

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☒ 0-6 in. ☐ 6-12 in. ☐ >12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.

2. What percentage of the site is covered by scrub/shrub vegetation? (60 % TBD acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft. ☐ 2-5 ft. ☒ >5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☒ dense ☐ patchy ☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:

☐ prairie/plains ☐ savannah ☐ old field ☒ other: dike tops

2. What percentage of the site is open field? (5 % TBD acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

Grass

4. What is the approximate average height of the dominant plant? 2 inches

5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes

☒ No If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?
 - ☐ Natural (pond, lake)
 - ☒ Man-made (lagoon, reservoir, canal, impoundment) **Spoils area with spillways**
2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?
Spoils area (occasionally inundated)
3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?
Dewatering of dredged sediments
4. What is the approximate size of the waterbody(s)? 20 acre(s)
5. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type (if known).
 - ☒ emergent ☐ submergent ☐ floating
6. If known, what is the depth of the water? **2-5 feet in spoils area (estimated), may vary depending on activity.**
7. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input checked="" type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (.10 in.)	<input checked="" type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) Substrate was not examined in detail		
8. What is the source of water in the waterbody?
 - ☐ River/stream/creek ☐ Groundwater ☐ Industrial discharge
 - ☐ Surface runoff ☒ Other (specify): **Dredge slurry**

9. Is there a discharge from the site to the waterbody? ☒ Yes ☐ No If yes, please describe this discharge and its path. **Discharge to the waterbody is dredged from river sediments.**

10. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

☒ River/stream/creek ☐ on-site ☒ off-site Distance: **200-300 ft.**

☐ Groundwater ☐ on-site ☐ off-site

☒ Wetland ☒ on-site ☐ off-site Distance: **Fringe wetlands; same as above.**

☐ Impoundment ☐ on-site ☐ off-site

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

NA Area

NA Depth (average)

NA Temperature (depth of water at which the reading was taken)

NA pH

NA Dissolved oxygen

NA Salinity

NA Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)

NA Other (specify)

12. Describe observed color and area of coloration.

Water was brown, turbid.

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

See Zone J, Figure 1.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

Sanderlings, heron, songbirds

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is(are) present at the site?

☐ River ☐ Stream ☐ Creek

☐ Dry wash ☐ Arroyo ☐ Brook

☒ Man-Made (ditch, etc.) ☐ Intermittent Stream ☐ Channeling

☐ Other (specify)

2. If known, what is the name of the waterbody?

Various drainage ditches, spillways

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?

☒ Yes ☐ No If yes, please describe indicators that were observed.

Fill activities.

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input checked="" type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (>10 in.)	<input checked="" type="checkbox"/> Silt (fine)	<input checked="" type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input checked="" type="checkbox"/> Concrete
<input checked="" type="checkbox"/> Other (specify) Substrate not examined in detail.		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

6. Is the system influenced by tides? ☐ Yes ☒ No What information was used to make this determination?

Based on design, spoils area is not affected by tide.

7. Is the flow intermittent? ☐ Yes ☒ No If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the water body? ☒ Yes ☐ No If yes, please describe the discharge and its path.

Cooper River and Clouter Creek receive dewatering discharge.

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

Clouter Creek discharges into the Cooper River at the Southern end of Clouter Island, and the Cooper then discharges into Charleston Harbor and the Atlantic Ocean.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

NA Width (ft.)

NA Depth (ft.)

NA Velocity (specify units:)

NA Temperature (depth of the water at which the reading was taken).

NA pH

NA Dissolved oxygen

NA Salinity

NA Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)

___ Other (specify)

11. Describe observed color and area of coloration.

Brownish, turbid.

12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.

☒ emergent

☐ submergent

☐ floating

13. Mark the flowing water system on the attached site map.

See Zone J, Figure 1.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates. fish, birds, mammals, etc.?

Abundant fiddler crab population. No benthic samples collected.

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

Draft Environmental Impact Statement and NWI maps.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and the site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected?

☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent

☒ Emergent

☒ Scrub/Shrub

☒ Wooded

☐ Other (specify)

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Both EEW and PWs along shorelines; interior of spoils area may be wetland habitat.

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☐ Fresh ☐ Brackish

What is the approximate area of the water (sq.ft.)?

Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat - Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

☐ Buttressing ☐ Water marks ☐ Mud cracks ☐ Debris line
☐ Other (describe below)

7. If known, what is the source of the water in the wetland?

☒ Stream/River/Creek/Lake/Pond ☐ Groundwater
☐ Flooding ☐ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.

Tidal and surface water runoff

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

Cooper River and Clouter Creek

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

Water content (dry, wet, saturated/unsaturated) N/A

11. Mark the observed wetland area(s) on the attached site map.

See Zone J, Figure 1.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

Appendix B
Checklists for Areas of Ecological Concern

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 7, 1995

1. Site Name: DRMO Wetland (AEC I-1)

Location: 35' NNW of Bldg. 1648

County: Charleston

City: Charleston

State: SC

2. Latitude: _____

Longitude: _____

3. What is the approximate area of the site? ≈ 1 acre

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): During ESA I Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

_____ % Urban

_____ % Rural

_____ % Residential

_____ % Industrial (☐ light ☐ heavy)

_____ % Agricultural

(Crops: _____)

_____ % Recreational

(Describe; note if it is a park, etc.)

_____ 100 % Undisturbed

_____ % Other _____

The area surrounding the site is:

_____ mile radius

_____ % Urban

_____ % Rural

_____ % Residential

_____ 100 % Industrial (☒ light ☐ heavy)

_____ % Agricultural

(Crops: _____)

_____ % Recreational

(Describe; note if it is a park, etc.)

_____ % Undisturbed

_____ % Other _____

8. Has any movement of soil taken place at the site? ☐ Yes ☒ No If yes, please identify the most likely cause of this disturbance:

_____ Agricultural Use

_____ Heavy Equipment

_____ Mining

_____ Natural Events

_____ Erosion

_____ X Other

Please describe:

It is unknown if any excavation has occurred at this AEC. (Possibly related to installation of sewer lines?)

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Site is a palustrine scrub-shrub wetland

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

DEIS, NWI, Site Visit (Phase I)

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) "Facility" is a wetland (see Section V)

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Previous investigations have detected Pb in surface soils but the area of contamination is downgradient (scrap bins)

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☐ swales ☐ depressions ☐ drainage ditches

☐ runoff ☐ windblown particulates ☐ vehicular traffic

☒ other (specify) possible storm water sewer lines still intact (no evidence, though)

13. If known, what is the approximate depth to the water table? water at surface (\approx 1 - 24" deep)

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☒ groundwater ☐ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance ≈ 200 yards east Cooper River) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Radfords (Flora)

Peterson's

Audubon

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☐ Yes ☒ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

20. Weather conditions at the time this checklist was prepared.

DATE: 4/7/95

70° Temperature (°C/°F)

70° Normal daily high temperature

N/Slight Wind (Direction/Speed)

None Precipitation (rain, snow)
(rained ≈ 2" previous day)

Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

AECI-1 is adjacent to 2 open storage areas (currently storing airplane tires, metal shelving to north on old 1608 foundation), vehicle, cabinets and lockers to east. Large warehouse to the south(1648) contributes water from rooftop drainage.

Grassy area between road and AEC may have once been storage area or landfill as indicated by areas of deteriorated asphalt and loading ramp on SE side of 1608B (now demolished.) Landfill is indicated by stained areas with evidence of solid waste disposal (metal objects, i.e., nuts/bolts, iron bars) and possible POL contamination.

Species observed at or near AECI-1

1) Mourning Dove — in nest with egg Common Elderberry

2) Redwing Blackbird Black Willow

3) Mockingbirds

4) Grackle

5) Killdeer (at RR across Ave B) with nest (2 eggs/1 hatchling)

— No evidence of storm sewer system (catch basing removed or buried)

— No obvious outfalls (sheet flow)

Completed by JRC

Additional Preparers FKS

DATE: 4/7/95

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

- ☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? 1 acre(s)

5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present (if known).

- ☐ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? _____

7. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) _____ | | |

8. What is the source of water in the waterbody?

- | | | |
|---|--|---|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> Groundwater | <input type="checkbox"/> Industrial discharge |
| <input type="checkbox"/> Surface runoff | <input type="checkbox"/> Other (specify) _____ | |

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

<u>1</u>	Area
<u>12"</u>	Depth (average)
_____	Temperature (depth of the water at which the reading was taken _____)
_____	pH
_____	Dissolved oxygen
_____	Salinity
_____	Turbidity (<u>clear</u> , slightly turbid, turbid, opaque) (Secchi disk depth <u>N/A</u>)
_____	Other (specify)

12. Describe observed color and area of coloration.

Clear with brown sediments/sheen observed on muddy areas

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI/DEIS

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☒ Submergent

☒ Emergent

☒ Scrub/Shrub

☒ Wooded

☒ Other (specify) Marginal grassy area

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Perimeter is primarily cattail/sedge grasses with young willow trees/"coffee bean." Central portion is scrub with small willow trees some uprooted (storm event.) Grassy field to east and along margin between north storage area and southern 1648.

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☒ Fresh ☐ Brackish

What is the approximate area of the water (sq. ft.)? <1 acre

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

Recent rain created damp perimeter in grass boundary; hydric soils likely.

6. Is there evidence of flooding at the site? ☒ Yes ☐ No What observations were noted?

☐ Buttressing ☐ Water marks ☐ Mud cracks ☒ Debris line

☒ Other (describe below) Permanent nature of wetland indicated by infrequency of mowing.

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond ☐ Groundwater

☒ Flooding ☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☐ Yes ☐ No If yes, please describe.

N/A

9. Is there a discharge from the wetland? ☐ Yes ☒ No If yes, to what waterbody is discharge released?

☐ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

Although storm sewers are indicated, none were observed

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

Water content (dry, wet, saturated/unsaturated) N/A

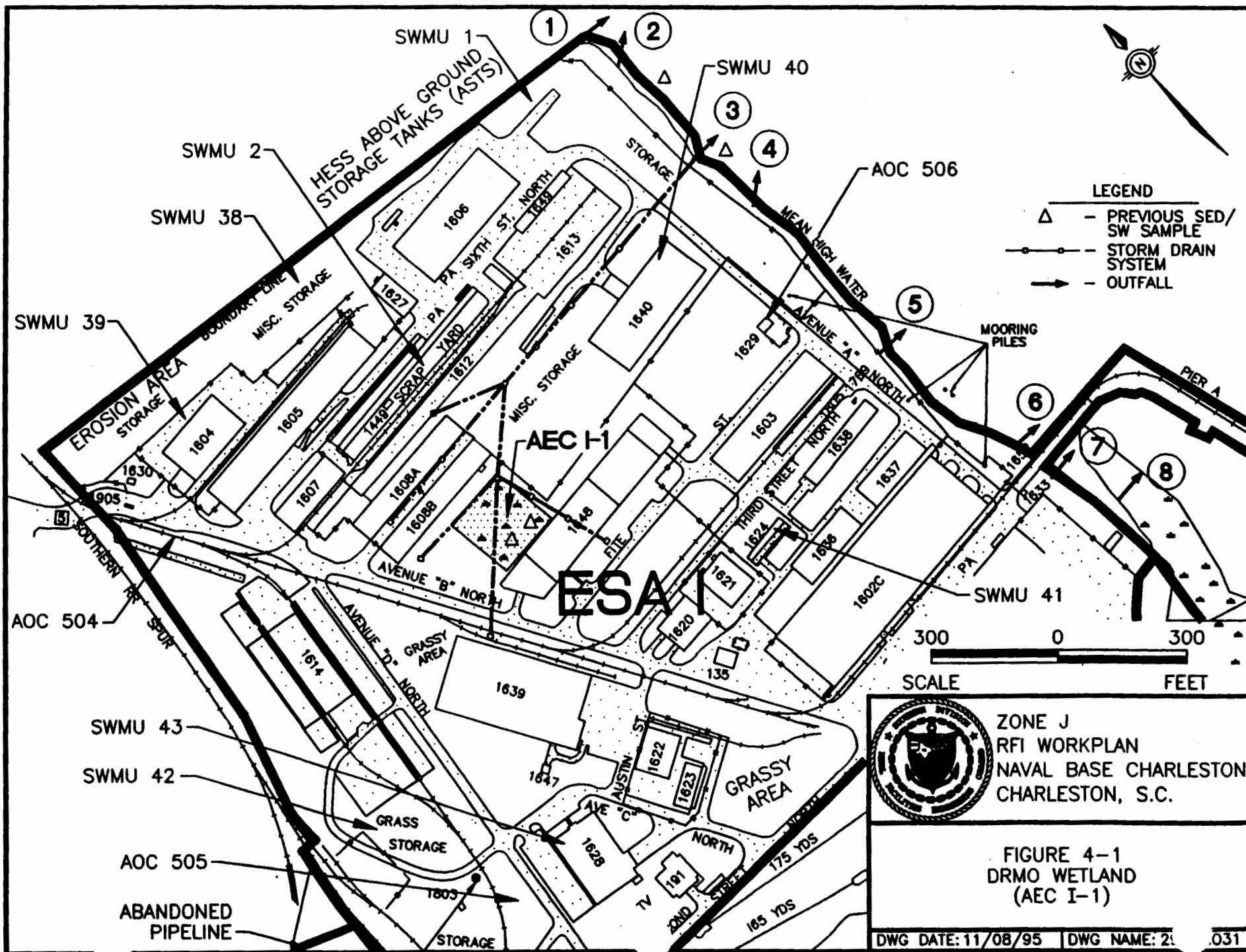
11. Mark the observed wetland area(s) on the attached site map.

See attached map

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]



EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 12, 1995

1. Site Name: Noisette Creek (AEC II-1)

Location: Base Golfcourse

County: Charleston

City: Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? ≈ 6 acres (water and wetland)

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): ESA II Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

____ % Urban

____ % Rural

____ % Residential

____ % Industrial (☐ light ☐ heavy)

____ % Agricultural

(Crops: _____)

____ % Recreational

(Describe; note if it is a park, etc.)

98 % Undisturbed

2 % Other _____

The area surrounding the site is:

____ mile radius

____ % Urban

____ % Rural

____ % Residential

____ % Industrial (☐ light ☐ heavy)

____ % Agricultural

(Crops: _____)

90 % Recreational

(Describe; note if it is a park, etc.)

____ % Undisturbed

10 % Other Cooper River

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

____ Agricultural Use

____ Heavy Equipment

____ Mining

____ Natural Events

X Erosion

____ Other

Please describe:

Tidal influence causes bank erosion. Rip rap and retaining wall on shore near mouth also foot bridge.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes, wetlands are present along shoreline (estuarine emergent.)

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

NWI, PSA (from shore and boat)

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) Golf course, coal piles (SWMU 44), adjacent railroad (AOC 507)

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Metals (SWMU 44) Herbicide/pesticide (golf course)

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☐ swales ☐ depressions ☒ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☒ other (specify) storm water lines/sump pit

13. If known, what is the approximate depth to the water table? at surface
-

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☐ groundwater ☐ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance adjacent) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Peterson's trees, trees and shrubs

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes ☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

Osprey seen foraging

20. Weather conditions at the time this checklist was prepared.

DATE: 4/12/95

80° Temperature (°C/°F)

 Normal daily high temperature

Calm Wind (Direction/Speed)

None Precipitation (rain, snow)
(rained ≈ 2" previous day)

Stly. Cloudy Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

— Noisette Creek is a 0.5 mile tributary to Cooper River, bordered on each shore by the golf course.

Fringe estuarine emergent/forested wetlands are present.

— Flooding of nearshore areas common during heavy storms.

— Several stormwater outfalls to Noisette Creek.

Fringe woods	Wetlands
1° Southern Hackberry	Needlerush
1° Wax Myrtle	Saw Grass
Saw Palmetto	Cattail
2° Eastern red cedar	
Yaupon	
2° Mulberry	
Popcorn	
Cane	
Black willow	
Privet	
Choake Cherry	
Tall Gallberry Holly	
Umbrella Magnolia	
French Tamerrisk	
Water Oak	
Live Oak	

Completed by JRC

Additional Preparers FKS

DATE: 4/12/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ Yes ☒ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? ____% (____ acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed)
Provide a photograph, if available.

Dominant plant, if known: _____

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☐ 0-6 in. ☐ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? ____% (____ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☐ 2-5 ft.

☐ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☐ dense

☐ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ Yes ☐ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☐ other (specify) _____

2. What percentage of the site is open field? ____ % (____ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: ☐ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field?
☐ Yes ☐ No If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

-
-
-

-
- This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

- ☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? 1 acre(s)

5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present (if known).

- ☐ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? _____

7. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) _____ | | |

8. What is the source of water in the waterbody?

- | | | |
|---|--|---|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> Groundwater | <input type="checkbox"/> Industrial discharge |
| <input type="checkbox"/> Surface runoff | <input type="checkbox"/> Other (specify) _____ | |

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

<u>1</u>	Area
<u>12"</u>	Depth (average)
_____	Temperature (depth of the water at which the reading was taken _____)
_____	pH
_____	Dissolved oxygen
_____	Salinity
_____	Turbidity (<u>clear</u> , slightly turbid, turbid, opaque) (Secchi disk depth <u>N/A</u>)
_____	Other (specify)

12. Describe observed color and area of coloration.

Clear with brown sediments/sheen observed on muddy areas

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST — FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

<input type="checkbox"/> River	<input type="checkbox"/> Stream	<input checked="" type="checkbox"/> Creek
<input type="checkbox"/> Dry wash	<input type="checkbox"/> Arroyo	<input type="checkbox"/> Brook
<input type="checkbox"/> Man-Made (ditch, etc.)	<input type="checkbox"/> Intermittent Stream	<input type="checkbox"/> Channeling
<input type="checkbox"/> Other (specify) _____		

2. If known, what is the name of the waterbody? Noisette Creek

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☒ Yes
☐ No If yes, please describe indicators that were observed.

Debris — concrete, flotsam, tire

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input checked="" type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input checked="" type="checkbox"/> Marl (shells)	<input checked="" type="checkbox"/> Detritus
<input checked="" type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) _____		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

Vegetated, steep, 3-6' (depending on tide)

Erosion/under cut in areas

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?

PSA, tide chart

7. Is the flow intermittent? ☐ Yes ☒ No If yes, please note the information that was used in making this determination.

PSA, record search, aerial photos

8. Is there a discharge from the site to the water body? ☐ Yes ☒ No If yes, please describe the discharge and its path.

Water body is site

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

To Cooper River

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

 Width (ft.) (SEE ESA II CHECK LIST)

5 - 7' Depth (ft.)

variable Velocity (specify units:)

— Temperature (depth of the water at which the reading was taken)

— pH

— Dissolved oxygen

— Salinity

turbid Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)

— Other (specify)

12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.
- ☒ emergent ☐ submergent ☐ floating
13. Mark the flowing water system on the attached site map.
14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

☒ emergent ☐ submergent ☐ floating

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

Mammals — raccoon tracks

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI/PSA

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent

☒ Emergent

☒ Scrub/Shrub

☒ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

See Summary in Section I

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☐ Fresh ☒ Brackish

What is the approximate area of the water (sq.ft.)? _____

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? ☐ Yes ☐ No What observations were noted?

☐ Buttressing ☒ Water marks ☒ Mud cracks ☐ Debris line

☐ Other (describe below) _____

7. If known, what is the source of the water in the wetland?

☒ Stream/River/Creek/Lake/Pond ☐ Groundwater

☐ Flooding ☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☐ Yes ☒ No If yes, please describe.

Site is a wetland

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) _____

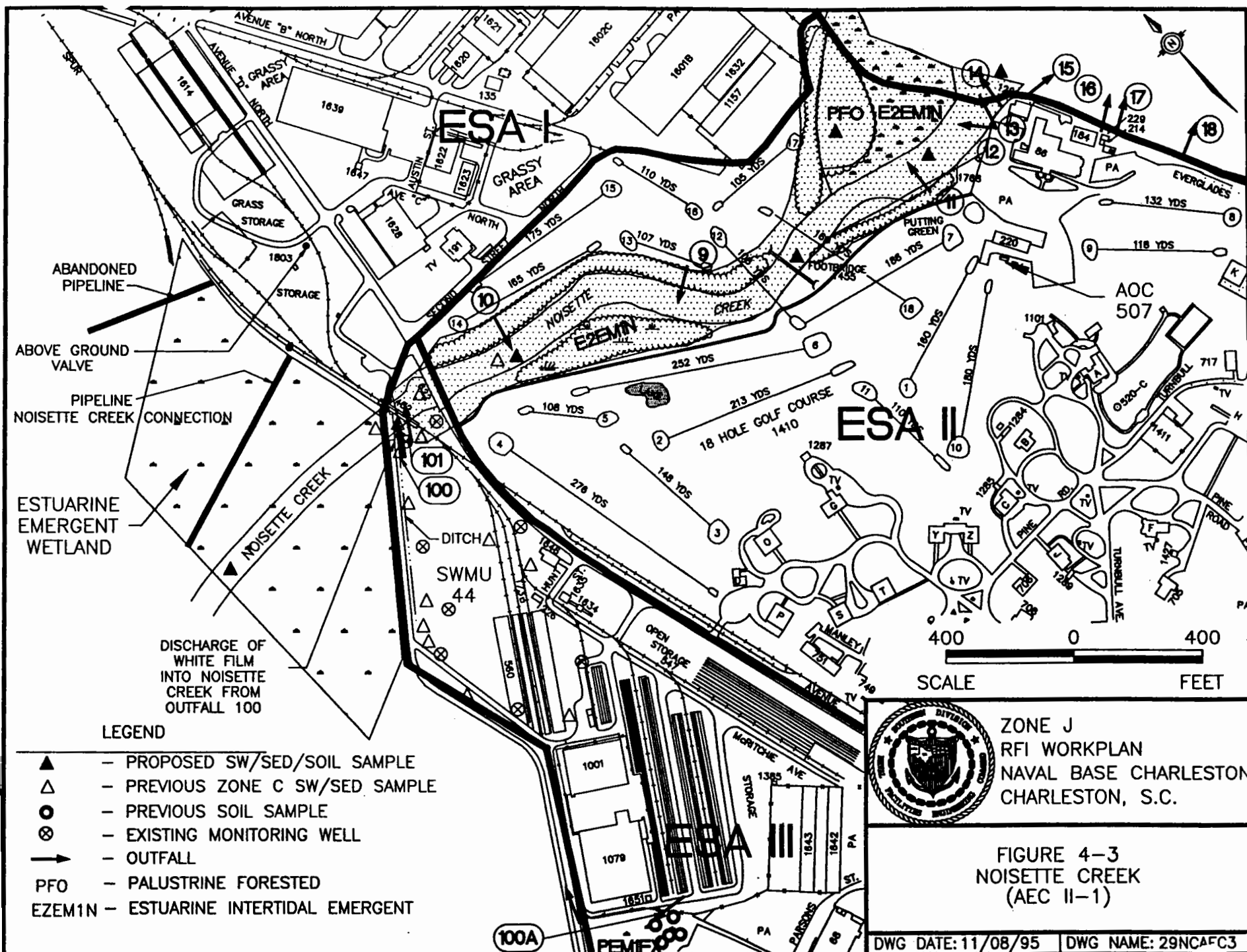
Water content (dry, wet, saturated/unsaturated) _____

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]



EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 7, 1995

1. Site Name: Incinerator Wetland (AEC III-1)

Location: South of Bldg. 1079

County: Charleston

City: Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 1.75 acre

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): ESA II Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

____ % Urban

____ % Rural

____ % Residential

____ % Industrial (☐ light ☐ heavy)

____ % Agricultural

(Crops: _____)

____ % Recreational

(Describe; note if it is a park, etc.)

75 % Undisturbed

25 % Other Former Incinerator

The area surrounding the site is:

____ mile radius

____ % Urban

____ % Rural

25 % Residential

25 % Industrial (☒ light ☐ heavy)

____ % Agricultural

(Crops: _____)

____ % Recreational

(Describe; note if it is a park, etc.)

____ % Undisturbed

10 % Other Roadway

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

____ Agricultural Use

X Heavy Equipment

____ Mining

____ Natural Events

X Erosion

____ Other

Please describe:

A mound of dirt was observed near former incinerator site, likely a remnant of demolition/regrading activity.

Erosion observed along fence line of Bldg. 1079 (AOC 509) and Bldg. 1651

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Site is wetland

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

NWI, DEIS, site observations

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) wetland is site/former incinerator (512)

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Metals/Dioxin from AOC 512

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☒ swales ☐ depressions ☒ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☒ other (specify) Storm sewers

13. If known, what is the approximate depth to the water table? at surface over most of site
-

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☒ groundwater ☒ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance _____) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Peterson's/Audubon Field Guides -- 30 minutes

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☒ Yes ☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

Loggerhead shrike observed in tree tops

20. Weather conditions at the time this checklist was prepared.

DATE: 4/7/95

70° Temperature (°C/°F)

 Normal daily high temperature

Calm Wind (Direction/Speed)

None Precipitation (rain, snow)
(rained 2" previous day)

Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

— AEC II-1 is located southwest of Bldg. 1079 and north of 807 (day care center) and is characterized as a palustrine emergent wetland. The eastern 1/3 of the site is upland (likely the former incinerator site (AOC 512 — Zone C).

— Two distinct drainage channels cross the wetland area; one along the Northern boundary and one diagonally across the center (south to north).

— Outfall 100A (the outfall E of it) has a yellowish tan "scum" on a 3 X 3 inclosed area.

Species Observed

Frogs (in ditches)

Fire ants (throughout)

Starlings (on fences and trees)

Grackle (on fences and trees)

Minnows (in deeper portions of ditches)

Completed by JRC/FKS

Additional Preparers _____

DATE: 4/7/95

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

- ☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? ≈ .5 - .75 acre(s)

5. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present (if known).

☒ emergent ☒ submergent ☒ floating

6. If known, what is the depth of the water? 0 - 18" (in ditches)

7. What is the general composition of the substrate? Check all that apply.

- | | | |
|---|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) <u>N/A</u> | | |
-

8. What is the source of water in the waterbody?

- | | | |
|---|--|---|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> Groundwater | <input type="checkbox"/> Industrial discharge |
| <input type="checkbox"/> Surface runoff | <input type="checkbox"/> Other (specify) _____ | |

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

.5-.75 acre Area

9" Depth (average)

N/A Temperature (depth of the water at which the reading was taken _____)

N/A pH

N/A Dissolved oxygen

N/A Salinity

Clear Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth N/A)

N/A Other (specify)

12. Describe observed color and area of coloration.

In outfall (northernmost) 100A? An opaque/tannish surface layer was observed between cement dividers in ditch.

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

See comments (Section I)

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI/PSA

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☒ Submergent

☒ Emergent

☒ Scrub/Shrub

☒ Wooded (sparsely)

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Overstory trees — Popcorn trees (pruning evident — why?) oak, southern hackberry and possumhaw
viburnum.

Scrub — coffeebean, cattail, young popcorn, sedge, needlerush, grasses

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☒ Fresh ☐ Brackish

What is the approximate area of the water (sq.ft.)? _____

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

Present in all ditches; seasonal and weather dependant

6. Is there evidence of flooding at the site? ☐ Yes ☐ No What observations were noted?

☐ Buttrressing ☐ Water marks ☐ Mud cracks ☐ Debris line

☐ Other (describe below) _____

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond ☐ Groundwater
☐ Flooding ☒ Surface Runoff
☒ Sewer outfalls/ditches

8. Is there a discharge from the site to a known or suspected wetland? ☐ Yes ☒ No If yes, please describe.

Discharge to ditches at northern double outfall to offsite ditch to Noisette creek

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River ☒ Groundwater ☐ Lake/Pond ☐ Marine

Noisette Creek

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

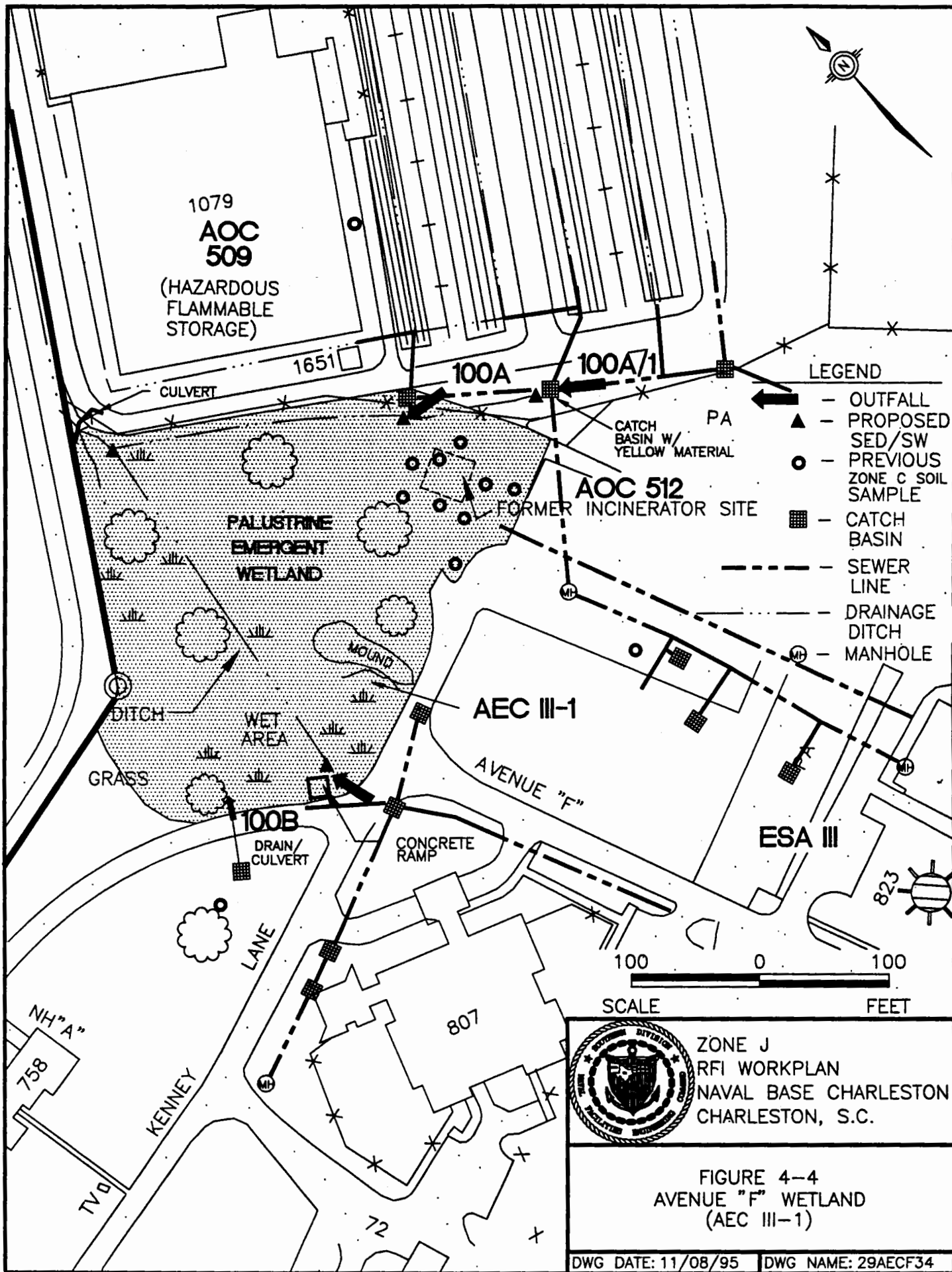
Water content (dry, wet, saturated/unsaturated) N/A

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]



EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 10, 1995

1. Site Name: Detention Ponds (AEC III-2)

Location: Corner of McMillan and St. John's Ave.

County: Charleston

City: Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 2.25 acre

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): ESA III Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

The area surrounding the site is:

.25 mile radius

 % Urban

 % Urban

 % Rural

 % Rural

_____% Residential

50 % Residential

____% Industrial(☐ light ☐ heavy)

40 % Industrial (■ light □ heavy)

 % Agricultural

 % Agricultural

(Crops: _____)

(Crops: _____)

 % Recreational

90 % Recreational

(Describe; note if it is a park, etc.)

(Describe; note if it is a park, etc.)

 % Undisturbed

 % Undisturbed

100 % Other Detention Ponds

10 % Other Roadway

8. Has any movement of soil taken place at the site? ☐ Yes ☒ No If yes, please identify the most likely cause of this disturbance:

 Agricultural Use

 Heavy Equipment

Mining

Natural Events

Erosion

_____ **Other**

Please describe:

[illegible]

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

No, (site itself is wetland)

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

N/A

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) Detention Ponds

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

— POLs(from roadside drainage)

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☐ swales ☐ depressions ☒ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☐ other (specify) _____

13. If known, what is the approximate depth to the water table? 0 - 6" (Ponds are ≈ 20' bgs)

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☐ surface water ☐ groundwater ☐ sewer ☒ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance 10,000' E) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Wetlands — W.A. Niering, Audubon Society Nature Guides

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☐ Yes ☒ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

20. Weather conditions at the time this checklist was prepared.

DATE: 4/10/95

80° Temperature (°C/°F) Normal daily high temperature

Light Wind (Direction/Speed) None Precipitation (rain, snow)

Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

— Detention Ponds are located south of Officer's Housing and north of railroad along McMillan Avenue.

— Surface of ponds are heavily vegetated with cattail, and other emergent wetland vegetation.

— Distinct channelization is present down center of ponds, flowing from main outfall at western end and numerous perimeter outfalls.

— Ponds are connected via spillway.

Completed by JRC/FKS

Additional Preparers _____

DATE: 4/10/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? 0 % (acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed)
Provide a photograph, if available.

Dominant plant, if known: _____

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☐ 0-6 in. ☐ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☐ No If no, go to Section C: Open Field.

2. What percentage of the site is covered by scrub/shrub vegetation? ____% (____ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☐ 2-5 ft.

☐ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☐ dense

☐ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ Yes ☐ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☐ other (specify) _____

2. What percentage of the site is open field? ____ % (____ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: ☐ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☐ Yes ☐ No If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

-
-
-
-

-
- This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page.

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

☐ Natural (pond, lake)
☒ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

Detention Ponds — non-flowing except during heavy storm events

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

Detention

4. What is the approximate size of the waterbody(s)? 2.25 acre(s)

5. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present (if known).

☒ emergent ☒ submergent ☐ floating

6. If known, what is the depth of the water? N/A

7. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) <u>N/A</u>		

8. What is the source of water in the waterbody?

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> Groundwater	<input type="checkbox"/> Industrial discharge
<input checked="" type="checkbox"/> Surface runoff	<input type="checkbox"/> Other (specify) _____	

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

N/A — site is the waterbody

10. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input checked="" type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input checked="" type="checkbox"/> off-site	Distance <u>10,000' E</u>
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

<u>2.25 acre</u>	Area
<u>≈ 1 - 2'</u>	Depth (average)
<u>—</u>	Temperature (depth of the water at which the reading was taken _____)
<u>—</u>	pH
<u>—</u>	Dissolved oxygen
<u>—</u>	Salinity
<u>—</u>	Turbidity (<u>clear</u> , slightly turbid, turbid, opaque) (Secchi disk depth <u>N/A</u>)
<u>—</u>	Other (specify)

12. Describe observed color and area of coloration.

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

See attached figure 3-5.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

— Morning Dove

— Starlings

— Mocking Bird

— Redwing Black Bird

— Boat Tail Grackle

IV. AQUATIC HABITAT CHECKLIST — FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

<input type="checkbox"/> River	<input type="checkbox"/> Stream	<input type="checkbox"/> Creek
<input type="checkbox"/> Dry wash	<input type="checkbox"/> Arroyo	<input type="checkbox"/> Brook
<input checked="" type="checkbox"/> Man-Made (ditch, etc.)	<input type="checkbox"/> Intermittent Stream	<input type="checkbox"/> Channeling
<input checked="" type="checkbox"/> Other (specify) <u>Detention Ponds</u>		

2. If known, what is the name of the waterbody? Facility 910

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☐ Yes
☐ No If yes, please describe indicators that were observed.

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input checked="" type="checkbox"/> Other (specify) <u>Unknown</u>		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

6. Is the system influenced by tides? ☐ Yes ☒ No What information was used to make this determination?

7. Is the flow intermittent? ☒ Yes ☐ No If yes, please note the information that was used in making this determination.

Storm dependant

8. Is there a discharge from the site to the water body? ☐ Yes ☐ No If yes, please describe the discharge and its path.

N/A

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

Ultimately to the Cooper River

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

_____ Width (ft.) (SEE ESA II CHECK LIST)

_____ Depth (ft.)

_____ Velocity (specify units: _____)

_____ Temperature (depth of the water at which the reading was taken _____)

_____ pH

_____ Dissolved oxygen

_____ Salinity

_____ Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)

_____ Other (specify)

-
-
-
-
-

- ☒ emergent ☐ submergent ☐ floating

- What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI/PSA

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☒ Submergent
☒ Scrub/Shrub

☒ Emergent
☐ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

1' — cattail in pond; banks have willow, grass/sedge. Channel is vegetated with emergent vegetation.

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☒ Fresh ☐ Brackish

What is the approximate area of the water (sq.ft.)? ≈ 3,000 square feet

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? ☐ Yes ☒ No What observations were noted?

☐ Buttreassing

☐ Water marks

☐ Mud cracks

☐ Debris line

☐ Other (describe below) None observed

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond

☐ Groundwater

☐ Flooding

☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☐ Yes ☒ No If yes, please describe.

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River

☐ Groundwater

☐ Lake/Pond

☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

Water content (dry, wet, saturated/unsaturated) N/A

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 10, 1995

1. Site Name: Chicora Marsh (AEC III-3)

Location: West of Recreation Area (1794)

County: Charleston

City: Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 0.5 acres

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): ESA III Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

The area surrounding the site is:

.25 mile radius

 % Urban

 % Urban

 % Rural

 % Rural

 % Residential

 % Residential

_____% Industrial(☐ light ☐ heavy)

20 % Industrial (■ light □ heavy)

_____% Agricultural

 % Agricultural

(Crops: _____)

(Crops: _____)

 % Recreational

 % Recreational

(Describe; note if it is a park, etc.)

(Describe; note if it is a park, etc.)

100 % Undisturbed(Undeveloped)

60 % Undisturbed

_____ % Other _____

20 % Other _____

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

 Agricultural Use

X Heavy Equipment

Mining

Natural Events

Erosion

 Other

Please describe:

Installation of "detention pond" and associated sewer line.

Figure 1. The effect of the concentration of the solution on the adsorption of the dye. The concentration of the solution was 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.5, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 15.0, 20.0, 30.0, 40.0, 50.0, 60.0, 70.0, 80.0, 90.0, 100.0, 150.0, 200.0, 300.0, 400.0, 500.0, 600.0, 700.0, 800.0, 900.0, 1000.0, 1500.0, 2000.0, 3000.0, 4000.0, 5000.0, 6000.0, 7000.0, 8000.0, 9000.0, 10000.0, 15000.0, 20000.0, 30000.0, 40000.0, 50000.0, 60000.0, 70000.0, 80000.0, 90000.0, 100000.0, 150000.0, 200000.0, 300000.0, 400000.0, 500000.0, 600000.0, 700000.0, 800000.0, 900000.0, 1000000.0, 1500000.0, 2000000.0, 3000000.0, 4000000.0, 5000000.0, 6000000.0, 7000000.0, 8000000.0, 9000000.0, 10000000.0, 15000000.0, 20000000.0, 30000000.0, 40000000.0, 50000000.0, 60000000.0, 70000000.0, 80000000.0, 90000000.0, 100000000.0, 150000000.0, 200000000.0, 300000000.0, 400000000.0, 500000000.0, 600000000.0, 700000000.0, 800000000.0, 900000000.0, 1000000000.0, 1500000000.0, 2000000000.0, 3000000000.0, 4000000000.0, 5000000000.0, 6000000000.0, 7000000000.0, 8000000000.0, 9000000000.0, 10000000000.0, 15000000000.0, 20000000000.0, 30000000000.0, 40000000000.0, 50000000000.0, 60000000000.0, 70000000000.0, 80000000000.0, 90000000000.0, 100000000000.0, 150000000000.0, 200000000000.0, 300000000000.0, 400000000000.0, 500000000000.0, 600000000000.0, 700000000000.0, 800000000000.0, 900000000000.0, 1000000000000.0, 1500000000000.0, 2000000000000.0, 3000000000000.0, 4000000000000.0, 5000000000000.0, 6000000000000.0, 7000000000000.0, 8000000000000.0, 9000000000000.0, 10000000000000.0, 15000000000000.0, 20000000000000.0, 30000000000000.0, 40000000000000.0, 50000000000000.0, 60000000000000.0, 70000000000000.0, 80000000000000.0, 90000000000000.0, 100000000000000.0, 150000000000000.0, 200000000000000.0, 300000000000000.0, 400000000000000.0, 500000000000000.0, 600000000000000.0, 700000000000000.0, 800000000000000.0, 900000000000000.0, 1000000000000000.0, 1500000000000000.0, 2000000000000000.0, 3000000000000000.0, 4000000000000000.0, 5000000000000000.0, 6000000000000000.0, 7000000000000000.0, 8000000000000000.0, 9000000000000000.0, 10000000000000000.0, 15000000000000000.0, 20000000000000000.0, 30000000000000000.0, 40000000000000000.0, 50000000000000000.0, 60000000000000000.0, 70000000000000000.0, 80000000000000000.0, 90000000000000000.0, 100000000000000000.0, 150000000000000000.0, 200000000000000000.0, 300000000000000000.0, 400000000000000000.0, 500000000000000000.0, 600000000000000000.0, 700000000000000000.0, 800000000000000000.0, 900000000000000000.0, 1000000000000000000.0, 1500000000000000000.0, 2000000000000000000.0, 3000000000000000000.0, 4000000000000000000.0, 5000000000000000000.0, 6000000000000000000.0, 7000000000000000000.0, 8000000000000000000.0, 9000000000000000000.0, 10000000000000000000.0, 15000000000000000000.0, 20000000000000000000.0, 30000000000000000000.0, 40000000000000000000.0, 50000000000000000000.0, 60000000000000000000.0, 70000000000000000000.0, 80000000000000000000.0, 90000000000000000000.0, 100000000000000000000.0, 150000000000000000000.0, 200000000000000000000.0, 300000000000000000000.0, 400000000000000000000.0, 500000000000000000000.0, 600000000000000000000.0, 700000000000000000000.0, 800000000000000000000.0, 900000000000000000000.0, 1000000000000000000000.0, 1500000000000000000000.0, 2000000000000000000000.0, 3000000000000000000000.0, 4000000000000000000000.0, 5000000000000000000000.0, 6000000000000000000000.0, 7000000000000000000000.0, 8000000000000000000000.0, 9000000000000000000000.0, 10000000000000000000000.0, 15000000000000000000000.0, 20000000000000000000000.0, 30000000000000000000000.0, 40000000000000000000000.0, 50000000000000000000000.0, 60000000000000000000000.0, 70000000000000000000000.0, 80000000000000000000000.0, 90000000000000000000000.0, 100000000000000000000000.0, 150000000000000000000000.0, 200000000000000000000000.0, 300000000000000000000000.0, 400000000000000000000000.0, 500000000000000000000000.0, 600000000000000000000000.0, 700000000000000000000000.0, 800000000000000000000000.0, 900000000000000000000000.0, 10000000

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes. Wetland immediate to west

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

NWI, DEIS, PSA

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) Tank farm to north

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

— Petroleum/Oil/Lubricants — TPH, BTEX

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☐ swales ☐ depressions ☒ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☐ other (specify) _____

13. If known, what is the approximate depth to the water table? at surface

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☐ groundwater ☐ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance immed. W) ☐ No

17. Is there evidence of flooding? ☐ Yes ☒ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Peterson's

Audubon

Radford's

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☒ Yes ☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

Osprey observed foraging overhead

20. Weather conditions at the time this checklist was prepared.

DATE: 4/10/95

80° Temperature (°C/°F)

7 Normal daily high temperature

Calm Wind (Direction/Speed)

None Precipitation (rain, snow)

Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

AEC III-3 is a vegetated drainage ditch/detention pond west of recreational area (1794).

— Eastward ditch discharges to wetland (offsite); narrow woods to north

— Abandoned pipelines east of fenceline sewerline?

— Two main outfalls (tidally influenced)

— A 20' wide, 150' long open water body is SW of the tank farm. An outfall is located on the NW corner and a spillway is at the south end, discharging adjacent to the main two spillways.

Birds

Trees

Osprey

Wax myrtle

Boattail Grackle

Black willow

Mulberry

Popcorn

Completed by JRC/FKS

Additional Preparers _____

DATE: 4/10/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? 50 % (.25 acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed) Provide a photograph, if available.

Dominant plant, if known: Deciduous

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☒ 0-6 in. ☐ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

Scrub/shrub

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? 25 % (acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

sapling/hackberry/popcorn; tall grasses

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☒ 2-5 ft.

☐ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☒ dense

☐ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ Yes ☒ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☐ other (specify) _____

2. What percentage of the site is open field? ____ % (____ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: ☐ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field?
☐ Yes ☐ No If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

See summary in Section 1

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

- ☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? .25 acre(s)

5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present (if known).

- ☐ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? _____

7. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) _____ | | |

8. What is the source of water in the waterbody?

- | | | |
|---|--|---|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> Groundwater | <input type="checkbox"/> Industrial discharge |
| <input type="checkbox"/> Surface runoff | <input type="checkbox"/> Other (specify) _____ | |

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

_____	Area
_____	Depth (average)
_____	Temperature (depth of the water at which the reading was taken _____)
_____	pH
_____	Dissolved oxygen
_____	Salinity
<u>Clear</u>	Turbidity (<u>clear</u> , slightly turbid, turbid, opaque) (Secchi disk depth <u>N/A</u>)
_____	Other (specify)

12. Describe observed color and area of coloration.

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

Jumping species (menhaden, shad)

IV. AQUATIC HABITAT CHECKLIST — FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

<input type="checkbox"/> River	<input type="checkbox"/> Stream	<input type="checkbox"/> Creek
<input type="checkbox"/> Dry wash	<input type="checkbox"/> Arroyo	<input type="checkbox"/> Brook
<input checked="" type="checkbox"/> Man-Made (ditch, etc.)	<input type="checkbox"/> Intermittent Stream	<input type="checkbox"/> Channeling
<input type="checkbox"/> Other (specify) _____		

2. If known, what is the name of the waterbody? None

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☐ Yes
☐ No If yes, please describe indicators that were observed.

N/A

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) <u>N/A</u>		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

Overgrown rip rap (in open water pond)

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?

PSA — Tide was flowing SW from main outfall (tide coming in)

7. Is the flow intermittent? ☐ Yes ☒ No If yes, please note the information that was used in making this determination.

Tidal

8. Is there a discharge from the site to the water body? ☒ Yes ☐ No If yes, please describe the discharge and its path.

Outfall in western corner of water body

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

Discharge from detention pond to outfall (see map)

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

30 X 150'

Width (ft.)

—

Depth (ft.)

—

Velocity (specify units: _____)

—

Temperature (depth of the water at which the reading was taken _____)

—

pH

—

Dissolved oxygen

—

Salinity

Clear

Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)

—

Other (specify)

-
-
-
-
-

- ☒ emergent ☐ submergent ☐ floating

- Mark the flowing water system on the attached site map.**

- Fish (menhaden, shad)
- Birds (redwing, grackle, starling)

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI, although extent is less than indicated on NWI maps.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent

☒ Emergent

☒ Scrub/Shrub

☐ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Cattail, wax myrtle (wetland to south has emergent needlerush)

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☐ Fresh ☒ Brackish

What is the approximate area of the water (sq.ft.)? 4,500

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? ☐ Yes ☒ No What observations were noted?

☐ Buttreassing

☐ Water marks

☐ Mud cracks

☐ Debris line

☐ Other (describe below) _____

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond

☐ Groundwater

☐ Flooding

☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River

☐ Groundwater

☐ Lake/Pond

☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

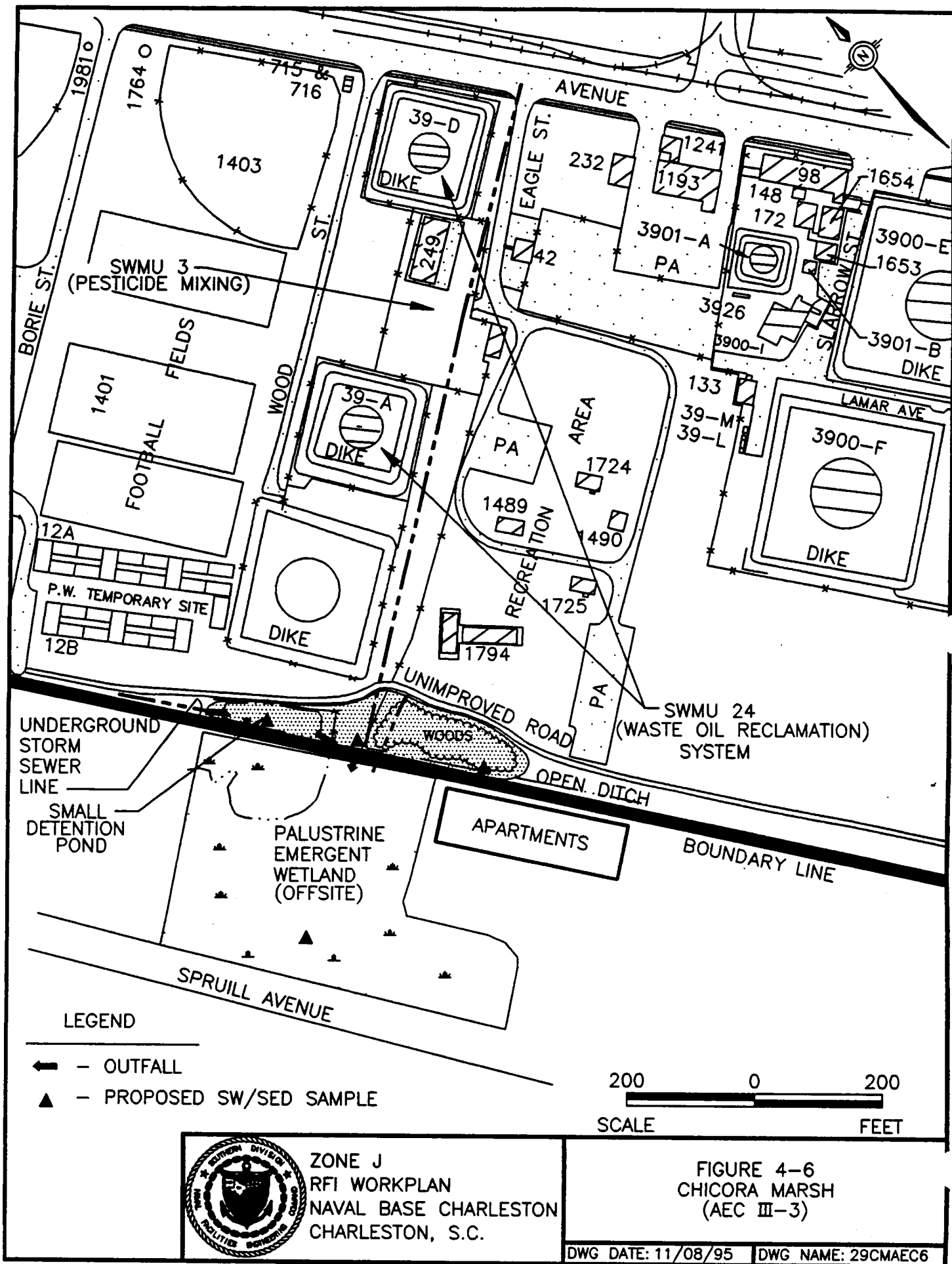
Water content (dry, wet, saturated/unsaturated) N/A

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]



EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 10, 1995

1. Site Name: Bldg. 224 Wetland (AEC IV-1)
Location: S and SW of Bldg. 224

County: Charleston City: Charleston State: SC
2. Latitude: Longitude:
3. What is the approximate area of the site? 3 acres
4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.
Date(s) of previous site visit(s): ESA IV Habitat Evaluation
5. Please attach USGS topographic map(s) of the site to the checklist, if available.
6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

_____ % Urban

_____ % Rural

_____ % Residential

_____ % Industrial (☐ light ☐ heavy)

_____ % Agricultural

(Crops: _____)

_____ % Recreational

(Describe; note if it is a park, etc.)

_____ % Undisturbed

_____ % Other _____

The area surrounding the site is:

.25 mile radius

_____ % Urban

_____ % Rural

_____ % Residential

25 % Industrial (☒ light ☐ heavy)

_____ % Agricultural

(Crops: _____)

75 % Recreational

(Describe; note if it is a park, etc.)

Picnic area

_____ % Undisturbed

_____ % Other _____

8. Has any movement of soil taken place at the site? ☐ Yes ☒ No If yes, please identify the most likely cause of this disturbance:

_____ Agricultural Use

_____ Heavy Equipment

_____ Mining

_____ Natural Events

_____ Erosion

_____ Other

Please describe:

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes, Palustrine emergent wetland 350' south of AEC.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

NWI, DEIS, PSA

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) Palustrine scrub-shrub/warehouse 224

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

unknown

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☒ swales ☒ depressions ☒ drainage ditches

☐ runoff ☐ windblown particulates ☐ vehicular traffic

☐ other (specify) _____

13. If known, what is the approximate depth to the water table? 0 - 1'

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☐ groundwater ☒ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☐ Yes ☒ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☐ Yes (approx. distance _____) ☒ No (Wetland)

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Audubon

Peterson's

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☒ Yes ☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

Osprey observed in vicinity but no appropriate forage habitat.

20. Weather conditions at the time this checklist was prepared.

DATE: 4/10/95

80° Temperature (°C/°F)

 Normal daily high temperature

Calm Wind (Direction/Speed)

None Precipitation (rain, snow)

Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

- AEC IV is a heavily vegetated drainage way (complex) north of an open field with sparse trees (hackberry, oak, mulberry)
- An unimproved road provides access to picnic area from both Forest Sherman Rd. and Viaduct Rd. (E loop)
- Several sinkholes were noted near ditch/dirt road intersection (origin)
- Evidence of spill (oil booms) at western ditch origin
- Some metal and concrete debris observed in souther fringe.

Species Observed

Southern bayberry/wax myrtle (dominant)	Mocking bird
Popcorn tree (dominant)	Boattail grackle
Southern Hackberry	Glass lizard
Saw Palmetto	Nest
Red Mulberry	Starlings
Black willow	
Eastern red cedar	
Yaupon	

Completed by JRC/FKS

Additional Preparers _____

DATE: 4/10/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ Yes ☒ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? ____% (____ acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed)
Provide a photograph, if available.

Dominant plant, if known: _____

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☐ 0-6 in. ☐ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☒ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? ____% (____ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☐ 2-5 ft.

☐ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☐ dense

☐ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☒ other (specify) grass field

2. What percentage of the site is open field? 60 % (1.8 acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

grass

4. What is the approximate average height of the dominant plant? 1" - mowed

5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field?
☐ Yes ☒ No If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

-
-
-
-

-
- This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page.

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? 1.5 acre(s)

5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present (if known).

☐ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? _____

7. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) <u>N/A</u>		

8. What is the source of water in the waterbody?

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> Groundwater	<input type="checkbox"/> Industrial discharge
<input type="checkbox"/> Surface runoff	<input type="checkbox"/> Other (specify) _____	

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

<u>1.5 acre</u>	Area
<u>0.3'</u>	Depth (average)
<u>—</u>	Temperature (depth of the water at which the reading was taken _____)
<u>—</u>	pH
<u>—</u>	Dissolved oxygen
<u>—</u>	Salinity
<u>Clear</u>	Turbidity (<u>clear</u> , slightly turbid, turbid, opaque) (Secchi disk depth <u>N/A</u>)
<u>—</u>	Other (specify)

12. Describe observed color and area of coloration.

None

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST — FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

<input type="checkbox"/> River	<input type="checkbox"/> Stream	<input type="checkbox"/> Creek
<input type="checkbox"/> Dry wash	<input type="checkbox"/> Arroyo	<input type="checkbox"/> Brook
<input checked="" type="checkbox"/> Man-Made (ditch, etc.)	<input type="checkbox"/> Intermittent Stream	<input type="checkbox"/> Channeling
<input type="checkbox"/> Other (specify) _____		

2. If known, what is the name of the waterbody? Bldg. 224 wetland

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☒ Yes
☐ No If yes, please describe indicators that were observed.

Some concrete and metal debris observed.

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input checked="" type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input checked="" type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) _____		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

1' bank in some areas; most gradual slope

6. Is the system influenced by tides? ☐ Yes ☒ No What information was used to make this determination?

7. Is the flow intermittent? ☒ Yes ☐ No If yes, please note the information that was used in making this determination.

Evidence of flooding; stagnant water

8. Is there a discharge from the site to the water body? ☐ Yes ☒ No If yes, please describe the discharge and its path.

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

Drainage ditches carry runoff to southern wetland, ultimately to Shipyard Creek.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

1' - 50' Width (ft.) (SEE ESA II CHECK LIST)

0 - 3' Depth (ft.)

no flow Velocity (specify units: _____)

— Temperature (depth of the water at which the reading was taken _____)

— pH

— Dissolved oxygen

— Salinity

Clear Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)

— Other (specify)

-
-
-
-
-

- ☒ emergent ☒ submergent ☐ floating

- What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

- See Section 1

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI/PSA

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☒ Submergent ☒ Emergent
☒ Scrub/Shrub ☐ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

1' cattail in central portion; popcorn, hackberry 1° in fringe

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☒ Fresh ☐ Brackish

What is the approximate area of the water (sq.ft.)? 1.0 acres

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? ☐ Yes ☐ No What observations were noted?

☐ Buttreassing

☐ Water marks

☒ Mud cracks

☒ Debris line

☐ Other (describe below) _____

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond

☐ Groundwater

☐ Flooding

☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.

Palustine emergent wetland south

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River

☐ Groundwater

☐ Lake/Pond

☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) N/A

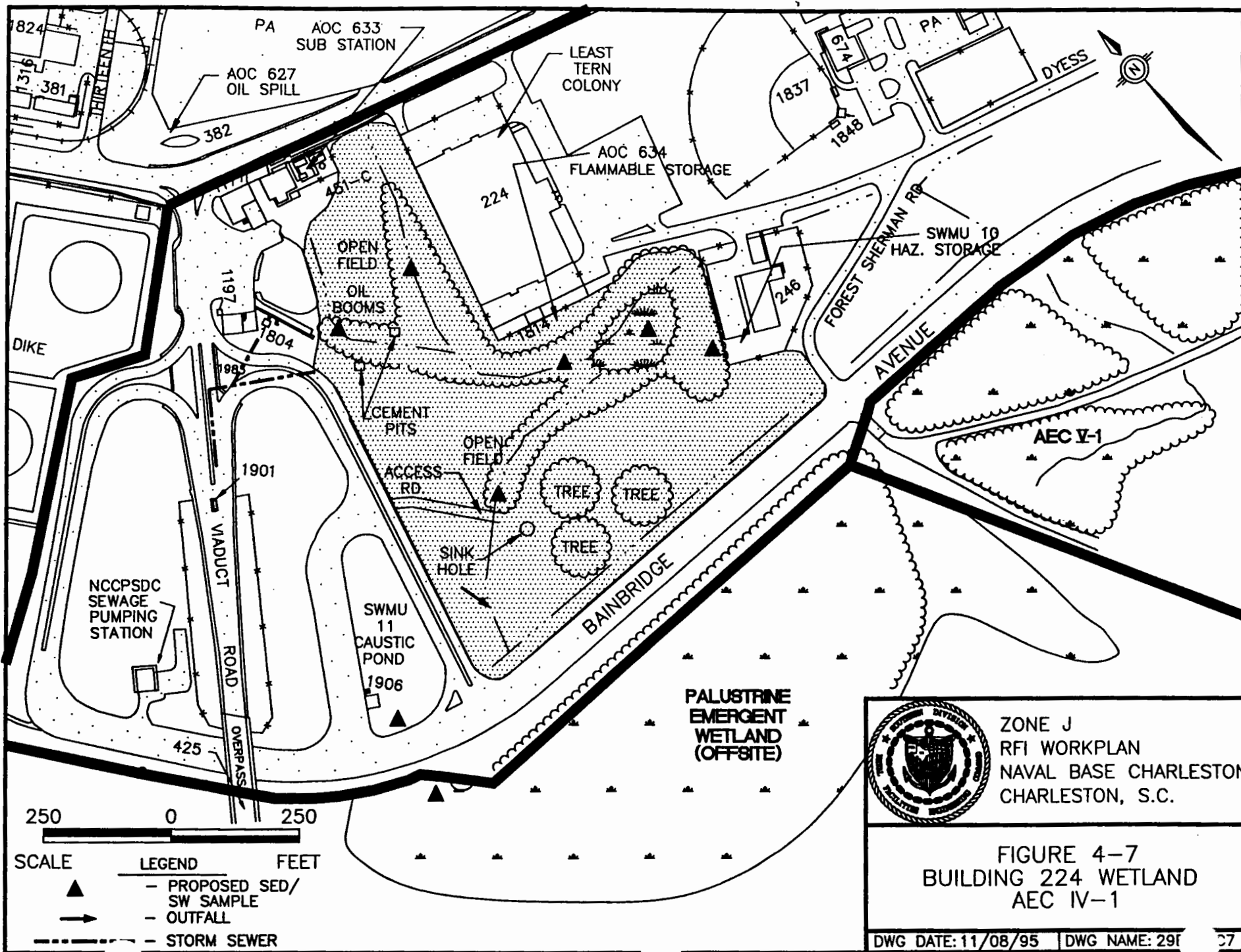
Water content (dry, wet, saturated/unsaturated) N/A

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]



ZONE J
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4-7
BUILDING 224 WETLAND
AEC IV-1

EnSafe -

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 13, 1995

1. Site Name: Headwaters of Shipyard Creek (AEC V-1)

Location: South of Bainbridge Avenue, West of Least Tern Lane

County: Charleston

City Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? ≈ .5 acres

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): Portions visited during ESA V Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

____ % Urban

____ % Rural

____ % Residential

10 % Industrial(☒ light ☐ heavy)

____ % Agricultural

(Crops: _____)

____ % Recreational

(Describe; note if it is a park, etc.)

90 % Undisturbed

____ % Other _____

The area surrounding the site is:

0.5 mile radius

____ % Urban

____ % Rural

____ % Residential

40 % Industrial (☒ light ☐ heavy)

____ % Agricultural

(Crops: _____)

____ % Recreational

(Describe; note if it is a park, etc.)

30 % Undisturbed (Roadway)

30 % Other (SWMU 20/TV pad)

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

____ Agricultural Use

X Heavy Equipment

____ Mining

____ Natural Events

____ Erosion

____ Other

Please describe:

Interview with public works trackhoe operator indicates SWMU 20 remedial/closure activities involved soil movement.

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? Describe. *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes. Site is headwaters to Shipyard Creek, a drainage way to the Cooper River.

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

Nation Wetland Inventory, Preliminary Site Assessment

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) Public Works Storage with Shipyard Creek and Associate Wetlands

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Metals and PCBs. Previous SW/SED samples found Cr⁺⁶, Pb

12. Check any potential routes of off-site migration of contaminants observed at the site:

☐ swales ☐ depressions ☒ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☐ other (specify) _____

13. If known, what is the approximate depth to the water table? 0 - 5'

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☐ groundwater ☐ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance 1000' South) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Peterson's Field Guide to Eastern Trees, Eastern Forests, Trees and Shrubs

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☐ Yes ☒ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

Osprey/Loggerhead Shrike confirmed residents

20. Weather conditions at the time this checklist was prepared.

DATE: 4/17

80° Temperature (°C/°F)

76° Normal daily high temperature

moderate Wind (Direction/Speed)

— Precipitation (rain, snow)

partly cloudy Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

- AEC V-1 is the headwaters to Shipyard Creek, receiving drainage from large offsite wetland & drainage ditches north of Bainbridge Avenue.
- Public Works Storage is located West of Shipyard Creek (Bldg. 904, 1838)
- A container box (trailer-size) company is located West of PW Storage.
- SWMU 20, former disposal area, is south of Plate Street, East of Shipyard Creek.
- SWMU 19 — solid waste transfer station, is to the east.

TREES

WETLAND

Eastern Red Cedar

Sawgrass

Popcorn

Needlerush

Wax Myrtle

Cattail

Hackberry

Blackwillow

Honeysuckle

Mulberry

Completed by FKS,JRC

Additional Preparers _____

DATE: 4/17/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? 20 % (5 acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed) Provide a photograph, if available.

Dominant plant, if known: Hackberry/Black Willow

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☒ 0-6 in. ☐ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

Wax Myrtle, Young Popcorn Trees

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? 15 % (3 acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

Wax Myrtle, Honeysuckle

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☒ 2-5 ft.

☐ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☒ dense

☐ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☒ other (specify) former landfill

2. What percentage of the site is open field? 10 % (2.5 acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

tall grass, intermixed with grass ground cover

4. What is the approximate average height of the dominant plant? 1'

5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field?
☐ Yes ☒ No If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

Snowy egret, redwing blackbird, fiddler crabs, sand crabs

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page or a sheet of stationery. There is no handwriting or other markings on the page.

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

_____	Area
_____	Depth (average)
_____	Temperature (depth of the water at which the reading was taken _____)
_____	pH
_____	Dissolved oxygen
_____	Salinity
_____	Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)
_____	Other (specify)

12. Describe observed color and area of coloration.

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

III. AQUATIC HABITAT CHECKLIST - NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

- ☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? _____ acre(s)

5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present (if known).

- ☐ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? _____

7. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) _____ | | |

8. What is the source of water in the waterbody?

- | | | |
|---|--|---|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> Groundwater | <input type="checkbox"/> Industrial discharge |
| <input type="checkbox"/> Surface runoff | <input type="checkbox"/> Other (specify) _____ | |

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST - FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

☐ River ☐ Stream ☒ Creek
☐ Dry wash ☐ Arroyo ☐ Brook
☒ Man-Made (ditch, etc.) ☐ Intermittent Stream ☐ Channeling
☒ Other (specify) low flow wetlands

2. If known, what is the name of the waterbody? Headwaters of Shipyard Creek

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☒ Yes
☐ No If yes, please describe indicators that were observed.

Concrete/Asphalt debris in between Bainbridge & Plate Street likely from closure activities of landfill.

4. What is the general composition of the substrate? Check all that apply.

☐ Bedrock ☒ Sand (coarse) ☐ Muck (fine/black)
☐ Boulder (> 10 in.) ☐ Silt (fine) ☒ Debris
☐ Cobble (2.5-10 in.) ☒ Marl (shells) ☐ Detritus
☒ Gravel (0.1-2.5 in.) ☐ Clay (slick) ☒ Concrete
☐ Other (specify) _____

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

Steep in areas; heavily eroded; vegetated with emergent vegetation

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?

Interview with Public Works personnel; visual observations.

7. Is the flow intermittent? ☒ Yes ☐ No If yes, please note the information that was used in making this determination.

PSA

8. Is there a discharge from a site to the water body? ☒ Yes ☐ No If yes, please describe the discharge and its path.

Evidence of heavy surface runoff south of Bldg. 1838 (in 3 separate locations) SED/SW sample

009M0004/009W0004 collected near these outfalls.

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

To Shipyard Creek and Cooper River.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

<u>1' - 8'</u>	Width (ft.)
<u>0 - 5'</u>	Depth (ft.)
<u>tidal</u>	Velocity (specify units: _____)
<u>—</u>	Temperature (depth of the water at which the reading was taken _____)
<u>—</u>	pH
<u>—</u>	Dissolved oxygen
<u>—</u>	Salinity
<u>ST</u>	Turbidity (clear, <u>slightly turbid</u> , turbid, opaque) (Secchi disk depth _____)
<u>—</u>	Other (specify)

11. Describe observed color and area of coloration.

12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.

☒ emergent

☐ submergent

☐ floating

13. Mark the flowing water system on the attached site map.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

Minnows observed in deeper portions of channel; snowy egret; raccoon tracks near Bldg. 1838.

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI, PSA

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent
☒ Scrub/Shrub

☒ Emergent
☒ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Channel is fringed with emergent vegetation (cattail, needlerush).

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☐ Fresh ☒ Brackish

What is the approximate area of the water (sq.ft.)? +20,000

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

☐ Buttrressing

☒ Water marks

☐ Mud cracks

☒ Debris line

☒ Other (describe below) Erosion pattern

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond

☐ Groundwater

☐ Flooding

☒ Surface Runoff (wetland)

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.

• Headwater wetlands discharge to Shipyard Creek wetlands (offsite)

• Site includes wetlands

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River

☐ Groundwater

☐ Lake/Pond

☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) black

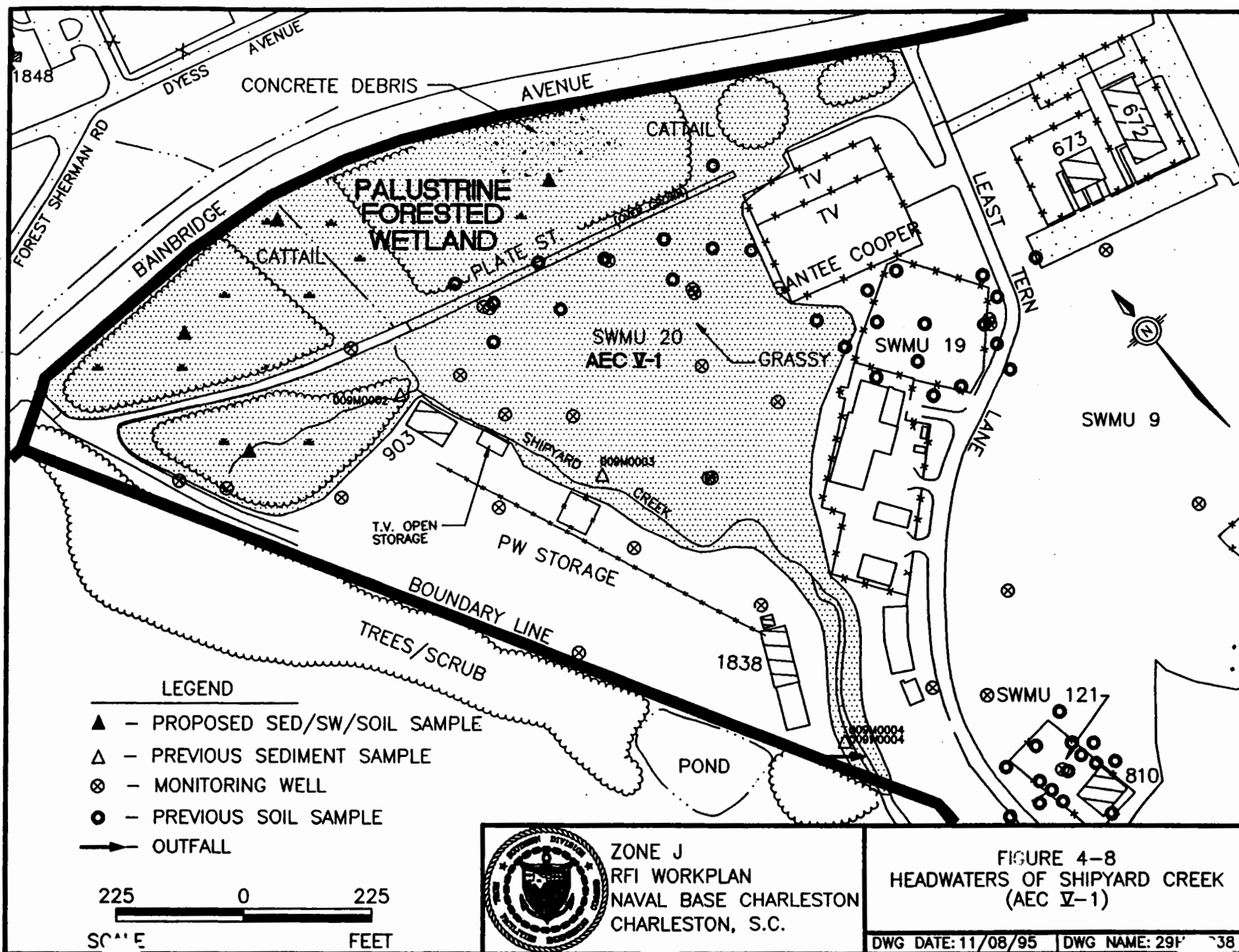
Water content (dry, wet, saturated/unsaturated)

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]



EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 13, 1995

1. Site Name: West Road Wetland/Woodland (AEC V-2)

Location: Southern tip of base (Bldg. 810 to clearing at south of Bldg. 676)

County: Charleston

City: Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 25 acres

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): ESA V Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

____ % Urban

____ % Rural

____ % Residential

2 % Industrial (☒ light ☐ heavy)

____ % Agricultural

(Crops: _____)

____ % Recreational

(Describe; note if it is a park, etc.)

98 % Undisturbed

____ % Other _____

The area surrounding the site is:

____ mile radius

____ % Urban

____ % Rural

____ % Residential

____ % Industrial (☐ light ☐ heavy)

____ % Agricultural

(Crops: _____)

20 % Recreational

(Describe; note if it is a park, etc.)

Athletic field

10 % Undisturbed (AEC V-3)

70 % Other Shipyard Creek

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

____ Agricultural Use

____ Heavy Equipment

____ Mining

____ Natural Events

____ Erosion

X Other

Please describe:

Fill (Historic)

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes, Shipyard Creek +(AEC V-3)

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

NWI, PSA

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) Wetland/woods, SWMU 159, SWMU 9, AOC 654, SWMU 21

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

SWMU 9 — Old Landfill

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☒ swales ☐ depressions ☒ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☐ other (specify) _____

13. If known, what is the approximate depth to the water table? 0 - 2'

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☒ groundwater ☐ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance 20' across West Rd.) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Peterson's Field Guides

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☒ Yes ☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

Loggerhead Shrike, Osprey observed; designated wading bird nesting colony

20. Weather conditions at the time this checklist was prepared.

DATE: 4/13/95 p.m. — 4/14/95 a.m.

75°-80° Temperature (°C/°F) 75° Normal daily high temperature

Calm Wind (Direction/Speed) — Precipitation (rain, snow)

Clear Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

AEC V-2 has wide variety of habitats which support numerous species.

Athletic field area/Holland Street (Bird Sanctuary)

PLANTS: loblolly pine, virginia creeper, hydrocotyl, honeysuckle, hackberry

WILDLIFE: brown thrasher, killdeer, mourning dove, green heron, snowy egret, dead raccoon

Along West Road

PLANTS: Popcorn tree, black willow, wax myrtle, southern hackberry, sycamore, saw palmetto, eastern red cedar, "coffee bean", privet, french tamarisk, white mulberry, rattlebox, possumhaw viburnum, tree-of-heaven, loblolly pine.

ANIMALS: cardinal, red-tailed hawk, heron, cedar waxwing, loggerhead shrike, shiners (in tidal culvert near West Road).

Completed by JRC

Additional Preparers FKS

DATE: 4/13/95 & 4/14/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? 25 % (6 acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

PSA

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed)
Provide a photograph, if available.

Dominant plant, if known: Hackberry, Mulberry

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☐ 0-6 in. ☒ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

Sapling/shrub

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? 70 % (20 acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

PSA

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

Wax myrtle, young mulberry, vines, "coffeebean", french tamarisk

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☐ 2-5 ft.

☒ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☒ dense

☐ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☒ other (specify) grassy fields

2. What percentage of the site is open field? 1 % (0.5 acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

Lawn grass south of Bldg. 668 (BEQ)

4. What is the approximate average height of the dominant plant? Mowed regularly

5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field?
☐ Yes ☒ No If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

See Section IA

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

- ☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? 17 acre(s)

5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present (if known).

- ☐ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water?

7. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) <hr/> | | |

8. What is the source of water in the waterbody?

- | | | |
|---|--|---|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> Groundwater | <input type="checkbox"/> Industrial discharge |
| <input type="checkbox"/> Surface runoff | <input type="checkbox"/> Other (specify) <hr/> | |

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

<u>17 acres</u>	Area
<u>0 - 2'</u>	Depth (average)
<u>—</u>	Temperature (depth of the water at which the reading was taken _____)
<u>—</u>	pH
<u>—</u>	Dissolved oxygen
<u>—</u>	Salinity
<u>ST</u>	Turbidity (clear, <u>slightly turbid</u> , turbid, opaque) (Secchi disk depth _____)
<u>—</u>	Other (specify)

12. Describe observed color and area of coloration.

Water was brownish blue

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

Fish: Minnows/shiners observed in open water at culvert spillway near Bldg. 661 (off West Road).

Birds: See Section IA

Mammals: Raccoon carcass/tracks

IV. AQUATIC HABITAT CHECKLIST — FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

<input type="checkbox"/> River	<input type="checkbox"/> Stream	<input type="checkbox"/> Creek
<input type="checkbox"/> Dry wash	<input type="checkbox"/> Arroyo	<input type="checkbox"/> Brook
<input checked="" type="checkbox"/> Man-Made (ditch, etc.)	<input type="checkbox"/> Intermittent Stream	<input type="checkbox"/> Channeling
<input type="checkbox"/> Other (specify) _____		

2. If known, what is the name of the waterbody? N/A

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☒ Yes
☐ No If yes, please describe indicators that were observed.

Debris noted (bottles, small trash)

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) _____		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

Ditches have variable bank — some deeply sloped/others more gradual

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?

Intertidal wetland along West Road (via culverts)

7. Is the flow intermittent? ☒ Yes ☐ No If yes, please note the information that was used in making this determination.

Visual observations, past site visits

8. Is there a discharge from the site to the water body? ☐ Yes ☐ No If yes, please describe the discharge and its path.

Site includes waterbodies (wetlands); SWMU 159 was observed to drain surface water to AEC V-2.

10" wide ditch was dry but bottom was rusty-brown from open storage area (scrap metal containers,

batteries, unmarked drum)

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

To shipyard Creek

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

variable Width (ft.)

variable Depth (ft.)

— Velocity (specify units:)

— Temperature (depth of the water at which the reading was taken)

— pH

— Dissolved oxygen

— Salinity

— Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)

 Other (specify)

-
-
-
-
-

- ☒ emergent ☐ submergent ☐ floating

- Mark the flowing water system on the attached site map.**

- See Section I (Summary Page)

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI/PSA

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent ☒ Emergent
☒ Scrub/Shrub ☒ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Perimeter woods — hackberry, wax myrtle, popcorn, black willow

Wetland — cattail, needlerush, sedge

Understory — scrub with tall grasses, vines

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☐ Fresh ☒ Brackish

What is the approximate area of the water (sq.ft.)? 17 acres is wet

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? ☐ Yes ☐ No What observations were noted?

☐ Buttreassing

☐ Water marks

☐ Mud cracks

☒ Debris line

☐ Other (describe below) _____

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond

☐ Groundwater

☒ Flooding

☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.

AEC V-2 discharge to fringe wetlands of Shipyard Creek.

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River

☐ Groundwater

☐ Lake/Pond

☐ Marine

Shipyard Creek

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) Zone H SW/Sediment — Sediment lt. brown

Water content (dry, wet, saturated/unsaturated) _____

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 19, 1995

1. Site Name: Dredge Materials Area and surroundings (AEC V-3)

Location: Southern end of Base

County: Charleston

City: Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 100 + acres

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): ESA V Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

_____ % Urban

_____ % Rural

_____ % Residential

_____ % Industrial (☐ light ☐ heavy)

_____ % Agricultural

(Crops: _____)

1 % Recreational

(Describe; note if it is a park, etc.)

Picnic area near X-54

39 % Undisturbed

60 % Other Dredge Material Area

The area surrounding the site is:

0.5 mile radius

_____ % Urban

_____ % Rural

_____ % Residential

15 % Industrial (☒ light ☐ heavy)

_____ % Agricultural

(Crops: _____)

_____ % Recreational

(Describe; note if it is a park, etc.)

10 % Undisturbed

75 % Other Open water

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

_____ Agricultural Use

X Heavy Equipment

_____ Mining

_____ Natural Events

_____ Erosion

_____ Other

Please describe:

— Spoil/fill activities

— Clearing near AOC 669, 684; laydown yard south of DMA

— Borrow pit at north end of Juneau (south of Partridge Ave.)

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

NWI, PSA

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) DMA, ammo bunkers (AOC 686-688), former burn pit (SWMU 12), chemical disposal yard (SWMU 14), smoke drum (AOC 685)

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Metals, Dioxin

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☒ swales ☐ depressions ☒ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☒ other (specify) Tidal inundation (flow-backflow)

13. If known, what is the approximate depth to the water table? 0 - 2'

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☐ groundwater ☐ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance adjacent) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Peterson's Field Guides

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☒ Yes ☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

Sea Purslane

20. Weather conditions at the time this checklist was prepared.

DATE: 4/18/95

88° Temperature (°C/°F)

76° Normal daily high temperature

Calm Wind (Direction/Speed)

— Precipitation (rain, snow)

Ptly. Cloudy Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

Juneau going South

Hackberry

Various Grasses

Green-backed heron

Mulberry

Pennywort

Fiddler Crabs

Popcorn

Honeysuckle

Choke Cherry

Yaupon

Black Willow

Needlerush

Cedar

Saw Palmetto

Possumhawviburnum (southern wild raisin)

Completed by JRC

Additional Preparers FKS

DATE: 4/18/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? 40 % (40 acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

Map/PSA

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed)
Provide a photograph, if available.

Dominant plant, if known: Hackberry/Mulberry

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☐ 0-6 in.

☒ 6-12 in.

☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

Wax myrtle/young hackberry and mulberry

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? 60 % (60 acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

Map of area and PSA

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

Wax myrtle, yaupon

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☒ 2-5 ft.

☐ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☒ dense

☐ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☒ Yes ☐ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☒ other (specify) athletic field

2. What percentage of the site is open field? 1 % (1 acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

Grass

4. What is the approximate average height of the dominant plant? 0" - 12"

5. Describe the vegetation cover: ☒ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field? ☒ Yes ☐ No If yes, identify and describe them below.

Interior of dredge material area (DMA) is a monotypic of dead scrub with patches of vegetation (wax myrtle/yaupon)

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

- Loggerhead shrike, snowy egret, green-backed heron, brown pelican, deer tracks, raccoon tracks, teal, shorebirds

-
- This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

☐ Natural (pond, lake)
☒ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

Dredge Material Area

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

Spoil disposal

4. What is the approximate size of the waterbody(s)? 75 acre(s)

5. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present (if known).

☒ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? 0 - 4' (in DMA)

7. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input checked="" type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input checked="" type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) _____		

8. What is the source of water in the waterbody?

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> Groundwater	<input type="checkbox"/> Industrial discharge
<input type="checkbox"/> Surface runoff	<input checked="" type="checkbox"/> Other (specify) <u>Dredge discharge (in DMA)</u>	

9. Is there a discharge from the site to the waterbody? ☒ Yes ☐ No If yes, please describe this discharge and its path.

Outfalls to Shipyard Creek and Cooper River from DMA, parking area

10. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input checked="" type="checkbox"/> Wetland	<input checked="" type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

<u>75 acres</u>	Area
<u>2'</u>	Depth (average)
<u>—</u>	Temperature (depth of the water at which the reading was taken _____)
<u>—</u>	pH
<u>—</u>	Dissolved oxygen
<u>—</u>	Salinity
<u>turbid</u>	Turbidity (clear, slightly turbid, <u>turbid</u> , opaque) (Secchi disk depth _____)
<u>—</u>	Other (specify)

12. Describe observed color and area of coloration.

Water is brownish, turbid

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.
-
-

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

— No macroinvertebrates observed during Aone I sediment: insect larvae (mosquito) abundant: small fish also present.

— Teal, heron, egret, osprey, shrike, cedar waxwing

— raccoon, deer

IV. AQUATIC HABITAT CHECKLIST — FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

- | | | |
|---|--|-------------------------------------|
| <input type="checkbox"/> River | <input type="checkbox"/> Stream | <input type="checkbox"/> Creek |
| <input type="checkbox"/> Dry wash | <input type="checkbox"/> Arroyo | <input type="checkbox"/> Brook |
| <input type="checkbox"/> Man-Made (ditch, etc.) | <input type="checkbox"/> Intermittent Stream | <input type="checkbox"/> Channeling |
| <input type="checkbox"/> Other (specify) _____ | | |

2. If known, what is the name of the waterbody? _____

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☒ Yes
☐ No If yes, please describe indicators that were observed.

4. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) _____ | | |

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

6. Is the system influenced by tides? ☐ Yes ☐ No What information was used to make this determination?

7. Is the flow intermittent? ☐ Yes ☐ No If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the water body? ☐ Yes ☐ No If yes, please describe the discharge and its path.

9. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

_____	Width (ft.)
_____	Depth (ft.)
_____	Velocity (specify units: _____)
_____	Temperature (depth of the water at which the reading was taken _____)
_____	pH
_____	Dissolved oxygen
_____	Salinity
_____	Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth _____)
_____	Other (specify)

-
-
-
-
-

- ☐ emergent ☐ submergent ☐ floating

-
- This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI/PSA (located south of DMA adjacent to Juneau Ave.)

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent
☒ Scrub/Shrub

☒ Emergent
☒ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Estuarine Emergent — needlerush, cattail, saltmeadow grass

Palustrine Forested — hackberry, wax myrtle

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☐ Fresh ☒ Brackish

What is the approximate area of the water (sq. ft.)? 4 acre

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? ☐ Yes ☐ No What observations were noted?

☐ Buttreassing ☒ Water marks ☒ Mud cracks ☒ Debris line

☐ Other (describe below) _____

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond ☐ Groundwater
☒ Flooding ☒ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.

DMA outfalls to ditches in E2SS1P

9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?

☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) black

Water content (dry, wet, saturated/unsaturated) saturated

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 19, 1995

1. Site Name: Shipyard Creek (AEC VII)

Location: Tributary at South end of Base

County: Charleston

City: Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? > 60 acres of open water/wetlands

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): ESA VII Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

_____ % Urban

_____ % Rural

_____ % Residential

_____ % Industrial (☐ light ☐ heavy)

_____ % Agricultural

(Crops: _____)

_____ % Recreational

(Describe; note if it is a park, etc.)

_____ % Undisturbed

100 % Other Tributary

The area surrounding the site is:

_____ mile radius

_____ % Urban

_____ % Rural

_____ % Residential

50 % Industrial (☐ light ☒ heavy)

_____ % Agricultural

(Crops: _____)

_____ % Recreational

(Describe; note if it is a park, etc.)

30 % Undisturbed

10 % Other Spoils Area

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

_____ Agricultural Use

_____ Heavy Equipment

_____ Mining

_____ Natural Events

_____ Erosion

X Other

Please describe:

Dredging

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes, Estuarine Emergent Wetlands along fringe/shoreline

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

NWI, PSA

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) Open water/wetlands

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Metals

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☐ swales ☐ depressions ☐ drainage ditches

☐ runoff ☐ windblown particulates ☐ vehicular traffic

☒ other (specify) Tidal flow

13. If known, what is the approximate depth to the water table? At surface

14. Is the direction of surface runoff apparent from site observation? ☒ Yes ☐ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☐ groundwater ☐ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance site is waterbody) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Peterson's Field Guides

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☒ Yes ☐ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

Osprey

20. Weather conditions at the time this checklist was prepared.

DATE: 4/19/95

+88° Temperature (°C/°F)

76° Normal daily high temperature

Gentle Wind (Direction/Speed)

— Precipitation (rain, snow)

Scattered Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

AEC VII is a tributary to the Cooper River which drains the southern portions of NAVBASE. COE maintains channel depth of +30' at mouth. Distinct outfalls observed as clearings in fringe vegetation along NAVBASE shoreline.

— Wooden "shoring" observed on northern shore

— Rebar poles in water (signifying dredged area boundary?)

— MacCalloy shore with significant debris, including rusted drums

— Explored 1/4 mile up side channel on west bank; led to culvert/dike w/monitoring well.

<u>Shrub Trees (along bank)</u>	<u>Wetland</u>	<u>Fringe</u>
<u>Hackberry</u>	<u>Cordgrass</u>	<u>Numerous herons, egret</u>
<u>Mulberry</u>		<u>Grackle (boat tail)</u>
<u>Popcorn</u>		<u>Osprey (nest on crane)</u>
<u>Wax Myrtle</u>		<u>Pair of redtail hawk</u>

Completed by JRC

Additional Preparers FKS

DATE: 4/19/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☐ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? ____% (____ acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed)
Provide a photograph, if available.

Dominant plant, if known: _____

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☐ 0-6 in. ☐ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☐ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? ____% (____ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☐ 2-5 ft.

☐ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☐ dense

☐ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ Yes ☐ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☐ other (specify) _____

2. What percentage of the site is open field? ____ % (____ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: ☐ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field?
☐ Yes ☐ No If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

-
-
-

-
- This image shows a single sheet of white paper with horizontal black ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

- ☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? 10 acre(s)

5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present (if known).

- ☐ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? _____

7. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) _____ | | |

8. What is the source of water in the waterbody?

- | | | |
|---|--|---|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> Groundwater | <input type="checkbox"/> Industrial discharge |
| <input type="checkbox"/> Surface runoff | <input type="checkbox"/> Other (specify) _____ | |

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

<u>10 acres</u>	Area
<u>0 - 4'</u>	Depth (average)
<u>—</u>	Temperature (depth of the water at which the reading was taken _____)
<u>—</u>	pH
<u>—</u>	Dissolved oxygen
<u>—</u>	Salinity
<u>turbid</u>	Turbidity (clear, slightly turbid, <u>turbid</u> , opaque) (Secchi disk depth _____)
<u>—</u>	Other (specify)

12. Describe observed color and area of coloration.

Water was turbid; brown

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST — FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

- | | | |
|---|--|---|
| <input type="checkbox"/> River | <input type="checkbox"/> Stream | <input checked="" type="checkbox"/> Creek |
| <input type="checkbox"/> Dry wash | <input type="checkbox"/> Arroyo | <input type="checkbox"/> Brook |
| <input type="checkbox"/> Man-Made (ditch, etc.) | <input type="checkbox"/> Intermittent Stream | <input type="checkbox"/> Channeling |
| <input type="checkbox"/> Other (specify) _____ | | |

2. If known, what is the name of the waterbody? Shipyard Creek

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☒ Yes
☐ No If yes, please describe indicators that were observed.

Dredge equipment present; known occurrence of dredging activities.

4. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) _____ | | |

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

Erosion in wetlands areas depending on tide; vegetation, cordgrass

6. Is the system influenced by tides? ☒ Yes ☐ No What information was used to make this determination?

PSA, Document Review

7. Is the flow intermittent? ☐ Yes ☒ No If yes, please note the information that was used in making this determination.

Tidally influenced; flow changes directions

8. Is there a discharge from the site to the water body? ☐ Yes ☐ No If yes, please describe the discharge and its path.

N/A — site is waterbody; numerous outfalls present from adjacent areas.

9. Is there a discharge from the waterbody? ☒ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

To Cooper River

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

10'-1000' Width (ft.)

0 - 35' Depth (ft.)

— Velocity (specify units:)

— Temperature (depth of the water at which the reading was taken)

— pH

— Dissolved oxygen

— Salinity

Turbid Turbidity (clear, slightly turbid, turbid, opaque) (Secchi disk depth)

— Other (specify)

11. Describe observed color and area of coloration.

Waterbody had brown film; evident on aquatic vegetation.

12. Is any aquatic vegetation present? ☒ Yes ☐ No If yes, please identify the type of vegetation present if known.

emergent

■ **submergent**

- floating

13. Mark the flowing water system on the attached site map.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

See Section IA

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☒ Yes ☐ No

Please note the sources of observations and information used. (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

NWI/PSA

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☒ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent

☒ Emergent

☐ Scrub/Shrub

☐ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

Cordgrass of variable width along both shorelines.

5. Is standing water present? ☒ Yes ☐ No If yes, is this water: ☐ Fresh ☒ Brackish

What is the approximate area of the water (sq.ft.)? 10 acres

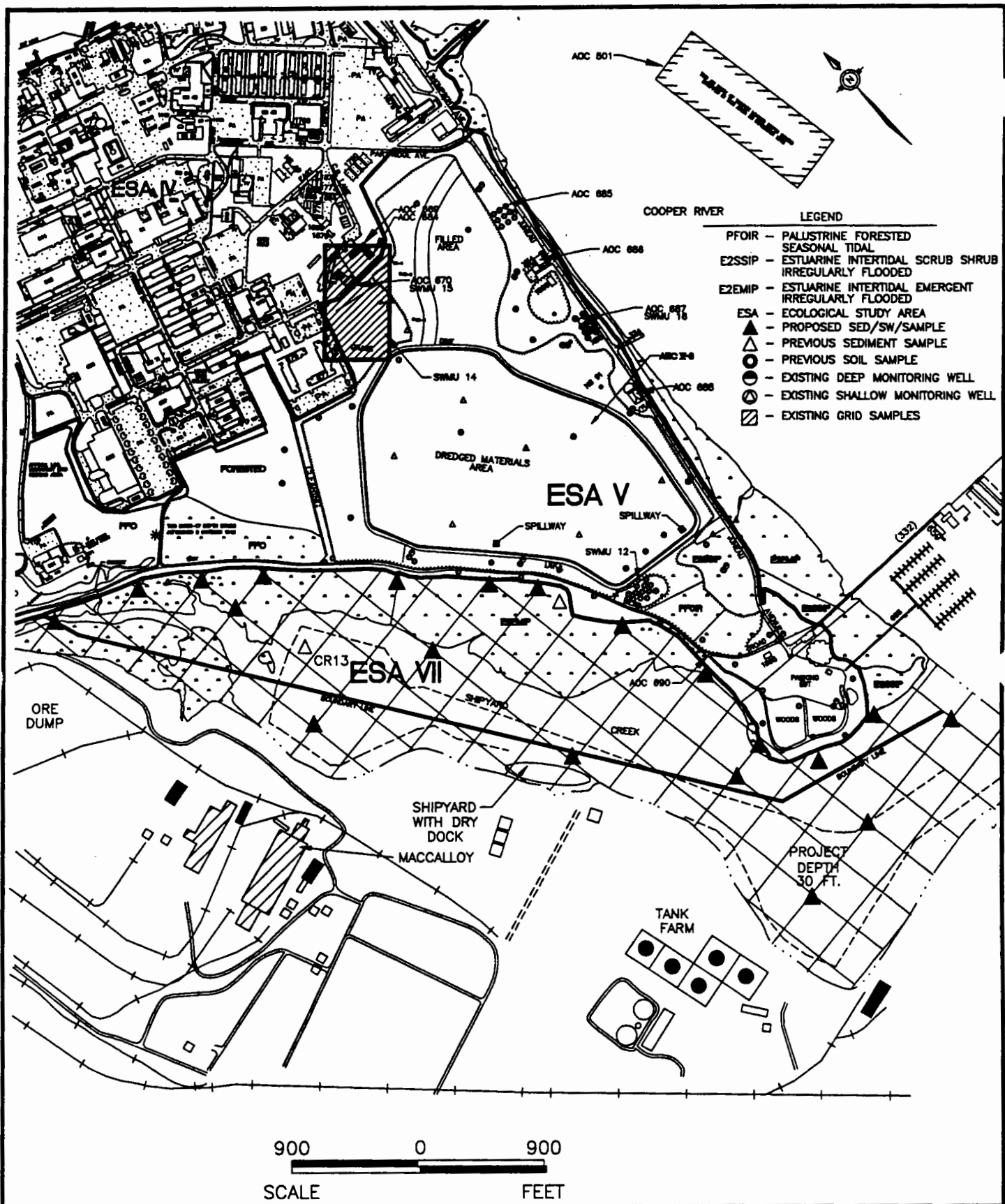
Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? ☐ Yes ☐ No What observations were noted?
- ☐ Buttrressing ☐ Water marks ☐ Mud cracks ☒ Debris line
- ☐ Other (describe below) _____
- _____
- _____
7. If known, what is the source of the water in the wetland?
- ☒ Stream/River/Creek/Lake/Pond ☐ Groundwater
- ☐ Flooding ☐ Surface Runoff
8. Is there a discharge from the site to a known or suspected wetland? ☒ Yes ☐ No If yes, please describe.
- Tidal flow from Shipyard Creek to Fringe wetland
- _____
- _____
- _____
9. Is there a discharge from the wetland? ☒ Yes ☐ No If yes, to what waterbody is discharge released?
- ☒ Surface stream/River ☐ Groundwater ☐ Lake/Pond ☐ Marine
- _____
10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.
- Color (blue/gray, brown, black, mottled) _____
- Water content (dry, wet, saturated/unsaturated) saturated
11. Mark the observed wetland area(s) on the attached site map.
- _____
- _____
- _____

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]



ZONE J
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4-12
SHIPYARD CREEK
AND SURROUNDINGS
(AEC VII)

EnSafe

CHECKLIST FOR ECOLOGICAL RISK ASSESSMENT/SAMPLING

I. SITE DESCRIPTION

Date: April 19, 1995

1. Site Name: Clouter Island AOCs (AEC VIII)

Location: East of Cooper River

County: Charleston

City: Charleston

State: SC

2. Latitude: _____ Longitude: _____

3. What is the approximate area of the site? 3 AOCs (693-695) occupy an area 5000 sq. ft. (including land between sites)

4. Is this the first site visit? ☐ Yes ☒ No If no, attach trip report of previous site visit(s) if available.

Date(s) of previous site visit(s): ESA VIII Habitat Evaluation

5. Please attach USGS topographic map(s) of the site to the checklist, if available.

6. Are aerial or other site photographs available? ☒ Yes ☐ No If yes, please attach any available photo(s) to the site map at the conclusion of this section.

7. The land use on the site is:

_____ % Urban

_____ % Rural

_____ % Residential

_____ % Industrial (☐ light ☐ heavy)

_____ % Agricultural

(Crops: _____)

_____ % Recreational

(Describe; note if it is a park, etc.)

_____ % Undisturbed

100 % Other (DMA)

The area surrounding the site is:

_____ mile radius

_____ % Urban

_____ % Rural

_____ % Residential

_____ % Industrial (☐ light ☒ heavy)

_____ % Agricultural

(Crops: _____)

_____ % Recreational

(Describe; note if it is a park, etc.)

_____ % Undisturbed

100 % Other (Open Water)

8. Has any movement of soil taken place at the site? ☒ Yes ☐ No If yes, please identify the most likely cause of this disturbance:

_____ Agricultural Use

_____ Heavy Equipment

_____ Mining

_____ Natural Events

_____ Erosion

X Other

Please describe:

Demolition of AOCs 693, 695; disposal of dredge material

9. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes, etc.? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Yes, Wetland habitat to North and East of AOCs

- 9a. Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

NWI/PSA

10. What type of facility is located at the site?

☐ chemical ☐ manufacturing ☐ mining ☐ waste disposal

☒ other (specify) Abandoned Fuse/Primer House; Ammo Depot, Loco. Shed

11. What are the suspected contaminants of concern at the site? If known, what are the maximum concentration levels?

Explosives, UXO?

12. Check any potential routes of off-site migration of contaminants observed at the site: (migration away from wetland)

☐ swales ☐ depressions ☐ drainage ditches

☒ runoff ☐ windblown particulates ☐ vehicular traffic

☐ other (specify) _____

13. If known, what is the approximate depth to the water table? 0 - 3'

14. Is the direction of surface runoff apparent from site observation? ☐ Yes ☒ No If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

☒ surface water ☐ groundwater ☐ sewer ☐ collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? ☒ Yes ☐ No

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist — Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist — Flowing Systems.

☒ Yes (approx. distance adjacent) ☐ No

17. Is there evidence of flooding? ☒ Yes ☐ No *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use the back of this page if additional space for text is needed.]

Peterson's Field Guides

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?
☐ Yes ☒ No *If yes, it is required to verify this information with the U.S. Fish and Wildlife Service. If species' identity is known please list them below.*

20. Weather conditions at the time this checklist was prepared.

DATE: 4/19/95

90° Temperature (°C/°F)

76° Normal daily high temperature

Gentle Wind (Direction/Speed)

— Precipitation (rain, snow)

Scattered Cloud cover

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

AEC VIII is the area across the Cooper River in the vicinity of AOCs 693-694. All AOCs have been demolished (foundation remains) except for 694, of which remains a metal shed (50 x 20) w/shell flooring and clapboard interior walls. AOCs located in Hackberry stand w/little undergrowth. (Debris pile near AOC 693.

Large piles of dry, grey clay (?) are on a southern concrete platform near River. Northern platform (180 x 60) still intact.

— Diesel stain near northern platform (likely from parked heavy equipment)

Trees

Fauna

Hackberry (1°)

Coyote (scat)

Wax Myrtle/Yaupon

Deer (scat, tracks)

Popcorn

Rabbit (scat)

Mulberry

Completed by JRC

Additional Preparers FKS

DATE: 4/19/95

II. TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? ☒ Yes ☐ No If no, go to Section B: Shrub/Scrub.
2. What percentage or area of the site is wooded? 95 % (acres). Indicate the wooded area on the site map attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen Deciduous Mixed)
Provide a photograph, if available.

Dominant plant, if known: Hackberry/Mulberry

4. What is the predominant size of the trees at the site? Use diameter at breast height.

☐ 0-6 in. ☒ 6-12 in. ☐ > 12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

Sparse @ AOC 693/694

IIB. SHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? ☒ Yes ☐ No If no, go to Section C: Open Field.
2. What percentage of the site is covered by scrub/shrub vegetation? 20 % (acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph if available.

Wax Myrtle

4. What is the approximate average height of the scrub/shrub vegetation?

☐ 0-2 ft.

☐ 2-5 ft.

☒ > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

☐ dense

☒ patchy

☐ sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? ☐ Yes ☒ No If yes, please indicate the type below:

☐ prairie/plains

☐ savannah

☐ old field

☐ other (specify) _____

2. What percentage of the site is open field? ____ % (____ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant? _____

5. Describe the vegetation cover: ☐ dense ☐ sparse ☐ patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site other than woods, scrub/shrub, and open field?
☒ Yes ☐ No If yes, identify and describe them below.

Roadways (undeveloped)

Beach front (sand)

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

Mosquitos; bees, wasps, lady bugs, gnats, spiders (orb-weavers).

Birds (see IA)

Mammals (see IA)

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

III. AQUATIC HABITAT CHECKLIST — NON-FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

- ☐ Natural (pond, lake)
☐ Man-made (lagoon, reservoir, canal, impoundment)

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

3. If a waterbody is present, what are the known uses of it (e.g.: recreation, navigation, etc.)?

4. What is the approximate size of the waterbody(s)? _____ acre(s)

5. Is any aquatic vegetation present? ☐ Yes ☐ No If yes, please identify the type of vegetation present (if known).

- ☐ emergent ☐ submergent ☐ floating

6. If known, what is the depth of the water? _____

7. What is the general composition of the substrate? Check all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Bedrock | <input type="checkbox"/> Sand (coarse) | <input type="checkbox"/> Muck (fine/black) |
| <input type="checkbox"/> Boulder (> 10 in.) | <input type="checkbox"/> Silt (fine) | <input type="checkbox"/> Debris |
| <input type="checkbox"/> Cobble (2.5-10 in.) | <input type="checkbox"/> Marl (shells) | <input type="checkbox"/> Detritus |
| <input type="checkbox"/> Gravel (0.1-2.5 in.) | <input type="checkbox"/> Clay (slick) | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Other (specify) _____ | | |

8. What is the source of water in the waterbody?

- | | | |
|---|--|---|
| <input type="checkbox"/> River/stream/creek | <input type="checkbox"/> Groundwater | <input type="checkbox"/> Industrial discharge |
| <input type="checkbox"/> Surface runoff | <input type="checkbox"/> Other (specify) _____ | |

9. Is there a discharge from the site to the waterbody? ☐ Yes ☐ No If yes, please describe this discharge and its path.

10. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

<input type="checkbox"/> River/stream/creek	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Groundwater	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	
<input type="checkbox"/> Wetland	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	Distance _____
<input type="checkbox"/> Impoundment	<input type="checkbox"/> on-site	<input type="checkbox"/> off-site	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

_____	Area
_____	Depth (average)
_____	Temperature (depth of the water at which the reading was taken _____)
_____	pH
_____	Dissolved oxygen
_____	Salinity
_____	Turbidity (clear, slightly turbid, <u>turbid</u> , opaque) (Secchi disk depth _____)
_____	Other (specify)

12. Describe observed color and area of coloration.

13. Mark the open-water, non-flowing system on the site map which will be attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

IV. AQUATIC HABITAT CHECKLIST — FLOWING SYSTEMS

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site?

<input type="checkbox"/> River	<input type="checkbox"/> Stream	<input type="checkbox"/> Creek
<input type="checkbox"/> Dry wash	<input type="checkbox"/> Arroyo	<input type="checkbox"/> Brook
<input type="checkbox"/> Man-Made (ditch, etc.)	<input type="checkbox"/> Intermittent Stream	<input type="checkbox"/> Channeling
<input type="checkbox"/> Other (specify) _____		

2. If known, what is the name of the waterbody? _____

3. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)? ☐ Yes
☐ No If yes, please describe indicators that were observed.

4. What is the general composition of the substrate? Check all that apply.

<input type="checkbox"/> Bedrock	<input type="checkbox"/> Sand (coarse)	<input type="checkbox"/> Muck (fine/black)
<input type="checkbox"/> Boulder (> 10 in.)	<input type="checkbox"/> Silt (fine)	<input type="checkbox"/> Debris
<input type="checkbox"/> Cobble (2.5-10 in.)	<input type="checkbox"/> Marl (shells)	<input type="checkbox"/> Detritus
<input type="checkbox"/> Gravel (0.1-2.5 in.)	<input type="checkbox"/> Clay (slick)	<input type="checkbox"/> Concrete
<input type="checkbox"/> Other (specify) _____		

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

6. Is the system influenced by tides? ☐ Yes ☐ No What information was used to make this determination?

7. Is the flow intermittent? ☐ Yes ☐ No If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the water body? ☐ Yes ☐ No If yes, please describe the discharge and its path.

9. Is there a discharge from the waterbody? ☐ Yes ☐ No If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure in the appropriate space below:

_____	Width (ft.)
_____	Depth (ft.)
_____	Velocity (specify units: _____)
_____	Temperature (depth of the water at which the reading was taken _____)
_____	pH
_____	Dissolved oxygen
_____	Salinity
_____	Turbidity (clear, slightly turbid, <u>turbid</u> , opaque) (Secchi disk depth _____)
_____	Other (specify)

-
-
-
-
-

- ☐ emergent ☐ submergent ☐ floating

- [illegible]

V. WETLAND HABITAT CHECKLIST

1. Based on observations and/or available information, are designated or known wetlands definitely present at the site? ☐ Yes ☐ No

Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) to make this determination.

2. Based on the location of the site (e.g., along a waterbody, in a floodplain, etc.) and site conditions (e.g., standing water; dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? ☐ Yes ☐ No If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland?

☐ Submergent ☐ Emergent
☐ Scrub/Shrub ☐ Wooded

☐ Other (specify) _____

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

5. Is standing water present? ☐ Yes ☐ No If yes, is this water: ☐ Fresh ☐ Brackish

What is the approximate area of the water (sq.ft.)? _____

Please complete questions 4, 11, 12 in Checklist III — Aquatic Habitat — Non-Flowing Systems.

6. Is there evidence of flooding at the site? ☐ Yes ☐ No What observations were noted?

☐ Buttrressing

☐ Water marks

☐ Mud cracks

☐ Debris line

☐ Other (describe below) _____

7. If known, what is the source of the water in the wetland?

☐ Stream/River/Creek/Lake/Pond

☐ Groundwater

☐ Flooding

☐ Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? ☐ Yes ☐ No If yes, please describe.

9. Is there a discharge from the wetland? ☐ Yes ☐ No If yes, to what waterbody is discharge released?

☐ Surface stream/River

☐ Groundwater

☐ Lake/Pond

☐ Marine

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/gray, brown, black, mottled) _____

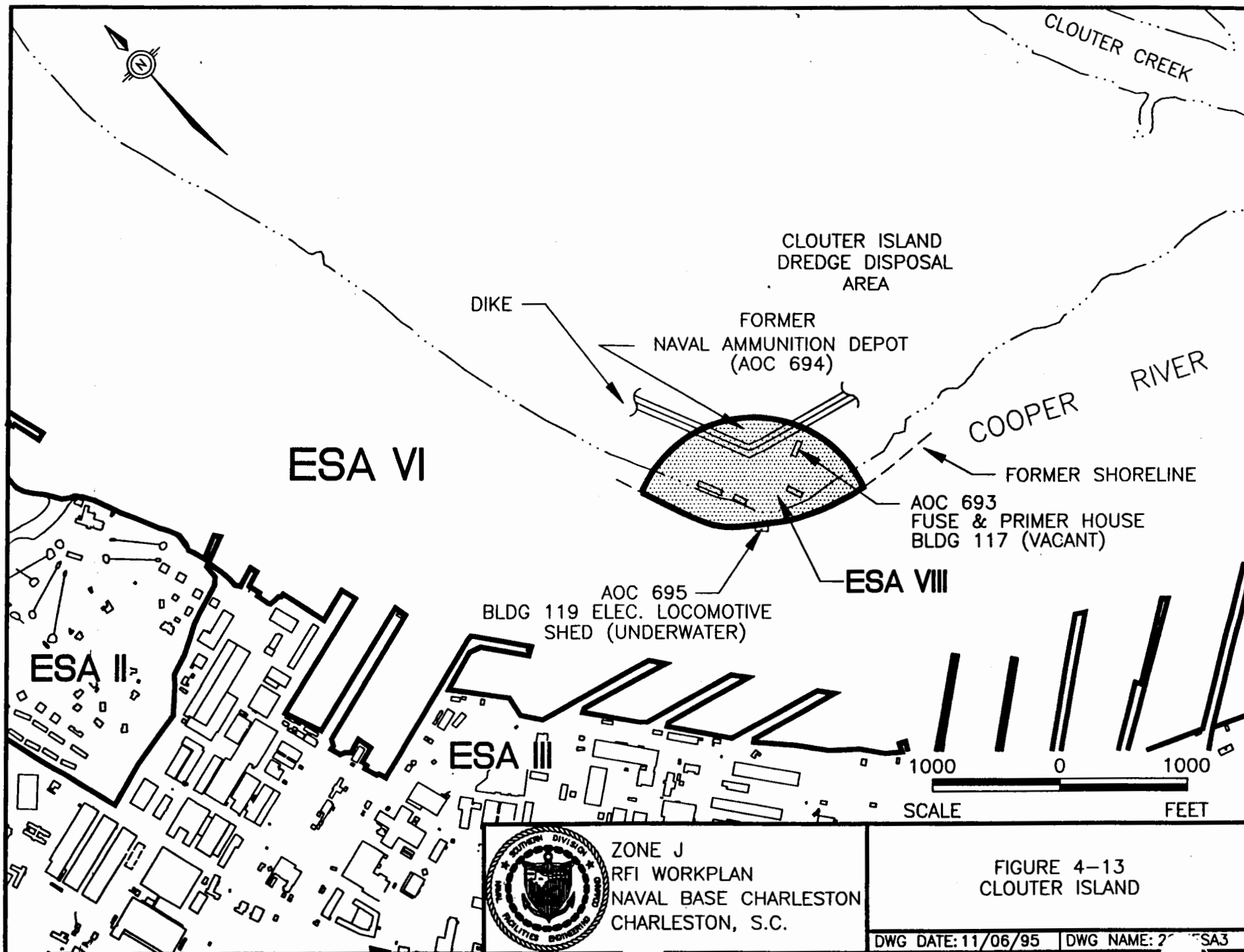
Water content (dry, __, saturated/unsaturated) _____

11. Mark the observed wetland area(s) on the attached site map.

EXPLANATION OF TERMS USED IN THIS CHECKLIST

Arroyo	Dry gulch, brook, or creek. A deep gully cut by an intermittent brook or stream.
Benthic	Pertaining to the bottom of a waterbody.
Detritus	Loose fragments or particles formed by the disintegration of rocks.
Marl	A mixture of clays, carbonates of calcium and magnesium and remnants of shells.
Riparian	Of, or on the bank of a natural course of water.
Secchi (disk)	Basic measure of turbidity, visibility or transparency of water.
Submergent Vegetation	Hidden, obscure vegetation which is inundated with water.
Swales	Low traces of land which are often moist or marshy.

[General format for checklists was taken from information provided at 1993 SETAC Short Course: Ecological Impact, Risk Assessments, and Cleanup Decisions at Hazardous Waste Site; presented by M.D. Sprenger and D.W. Charters, USEPA.]



Appendix C
Directions to Emergency Medical Facilities

DIRECTIONS TO THE NEAREST MEDICAL FACILITY

**Baker Hospital
Baker Hospital Blvd.
Charleston, South Carolina**

General Telephone Number — (803) 744-2110

Directions to Baker Hospital from the Main Gate of NAVBASE:

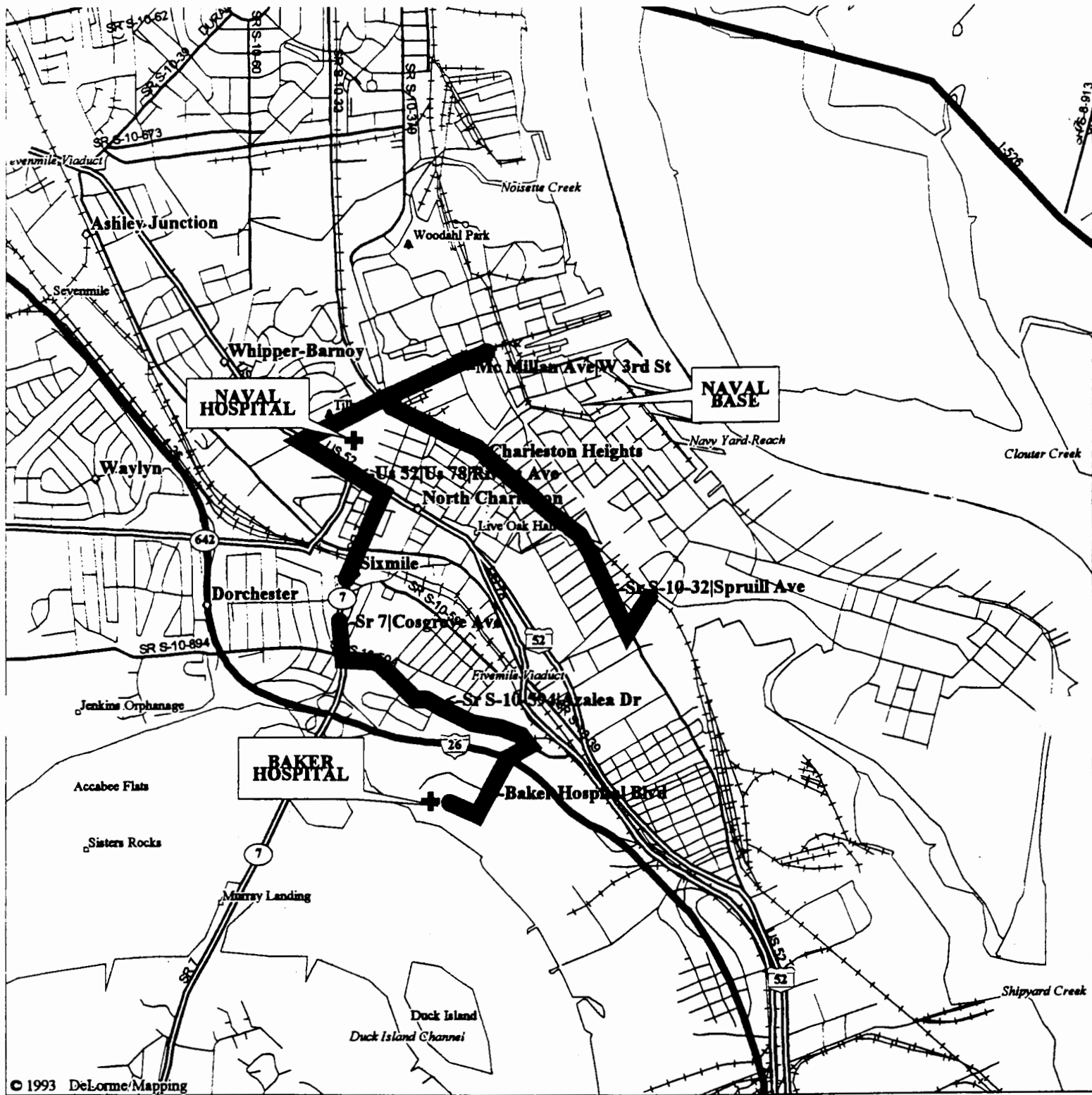
1. Exit the Main Gate (McMillan Gate). Continue west on McMillan to US Highway 52.
2. Turn left (east) on US Highway 52 and proceed to State Route 7.
3. Turn right (south) on State Route 7 and proceed to Interstate 26.
4. Turn left (east) on Interstate 26 and proceed to Baker Hospital Boulevard.
5. Turn right (south) on Baker Hospital Boulevard and proceed approximately 0.2 miles to the Baker Hospital Emergency Room.

NOTE: The nearest hospital to the site is the Charleston Naval Hospital. This hospital should be used for all life threatening medical emergencies. For other medical services please use Baker Hospital.

Naval Hospital Emergency Room Telephone Number: (803) 743-7011
Naval Hospital General Information Number: (803) 743-7000

Directions to Charleston Naval Hospital From Main Gate NAVBASE:

- 1) Refer to following map to the Charleston Naval Hospital.
- 2) Exit Naval Base via the Main Gate (McMillan Gate).
- 3) Proceed west, toward Rivers Avenue.
- 4) At the intersection of McMillan and Rivers, the hospital is on the left.
 - Hospital entrance is just before the intersection.
 - Hospital is approximately 1/2 mile from the Main Gate.



LEGEND

- State Route
- Geo Feature
- ◇ Town, Small City
- ▲ Park
- Interstate, Turnpike
- US Highway
- County Boundary
- Population Center

- Street, Road
- Hwy Ramp
- Major Street/Road
- Interstate Highway
- State Route
- US Highway
- Railroad
- River

Scale 1:31,250 (at center)

2000 Feet

1000 Meters

Mag 14.00

Tue Mar 14 10:16:34 1995

Appendix D
Health and Safety Plan Forms

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to: EnSafe/Allen & Hoshall, Memphis, Tennessee.

Job No: 0029 — 00104

Contract No: N62467-89-D-0318

Project: Zone J — Naval Base Charleston

I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

Signed

Print Name

Company

Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee: _____

Job Name: _____

Date(s) From/To: _____

Hours Onsite: _____

Contaminants (Suspected/Reported):

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions:

ACCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT		DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS	
TO		FROM	
		TELEPHONE (Include area code)	
NAME OF INJURED OR ILL WORKER AND COMPANY			
WORKER'S SOCIAL SECURITY NUMBER			
DATE OF ACCIDENT		TIME OF ACCIDENT	EXACT LOCATION OF ACCIDENT
NARRATIVE DESCRIPTION OF ACCIDENT			
NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED		LOST TIME YES <input type="checkbox"/> NO <input type="checkbox"/>	
PROBABLE DISABILITY (Check one)			
FATAL <input type="checkbox"/>		LOST WORK DAY WITH ____ DAYS LOST WORK DAY WITH ____ DAYS AWAY FROM WORK OF RESTRICTED ACTIVITY	
		NO LOST WORK DAY <input type="checkbox"/> FIRST-AID ONLY <input type="checkbox"/>	
CORRECTIVE ACTION RECOMMENDED (By whom and by when)			
NAME OF SUPERVISOR		TITLE	
SIGNATURE		DATE	

Appendix E
Material Safety Data Sheets

MSDSs for Zone J will be included only in the field copies of the Work Plan.

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA
CTO-029**



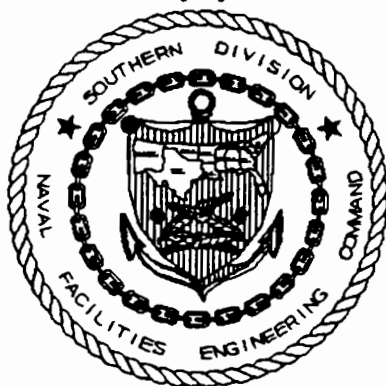
RESPONSE TO COMMENTS FOR

**ZONE I RCRA FACILITY INVESTIGATION REPORT
AOC 681
(Dated January 1996)**

Prepared for:

**Department of the Navy
Southern Division
Naval Facilities Engineering Command
Charleston, South Carolina**

**SOUTHDIV Contract Number:
N62467-89-D-0318**



Prepared by:

**EnSafe Inc.
5724 Summer Trees Drive
Memphis, Tennessee 38134
(901) 372-7962**

**July 30, 1999
Revision: 0**

**SCDHEC Comments on Risk Assessment Portion of The
Zone I RCRA Facility Investigation Report
(Dated January 1996) NAVBASE Charleston**

**AOC 681
RFI Report Addendum
July 30, 1999**

Comment 15:

Section 10.6.5.1 AOC 681. When discussing the fate and transport of all the ten organic constituents detected above their RBCs, at this site, it will be helpful to include a discussion on soil type, groundwater depth and meteorological (weather) conditions. According to Section 8.4 the soil type is sandy and the soil is low in organic carbon. The above mentioned factors, beside the Koc value of each constituents, are important in determining the fate and transport of each constituents. The possibility of soil-to-groundwater cross-media transport should be carefully analyzed in the absence of groundwater sampling. On the other hand, groundwater samples could be collected to demonstrate that this media has not been impacted.

Response 15:

First, please note that Section 10.6.5 of the draft document is Section 10.6.7 in the revised report addendum. Three groundwater monitoring wells were installed at AOC 681 in 1998. These wells were sampled in three rounds in late 1998 and early 1999. The results of the sampling are discussed in Section 10.6.4 as well as in the Fate and Transport Section (10.6.7). Additionally, soil and groundwater samples were collected via DPT (geoprobe sampling) at AOC 681 in March 1998. Results from this sampling event are included in revised Sections 10.6.2 and 10.6.4 as well as in revised Section 10.6.7 (Fate and Transport).

Comment 16:

Section 10 AOC 681. Considering the fact that so many organic chemicals are detected above their soil water protection SSL and that Benzo (a) pyrene was recognized as a COPC, based on the result of Wilcoxon rank sum test, a groundwater sampling is recommended at this site with analysis for VOCs and SVOCs.

Response 16:

The Wilcoxon rank sum test is not run on benzo(a)pyrene results since it is an organic compound. As noted above, three groundwater monitoring wells were installed and sampled and groundwater samples were collected from three DPT points at AOC 681. All the groundwater samples were analyzed for VOCs and SVOCs. The results of the soil sampling is presented in the Nature and Extent of Contamination discussion in Section 10.6.2 of the report addendum while the results of the groundwater sampling are discussed in Section 10.6.4 of the report addendum. PAHs were the only organics detected above SSLs in subsurface soil samples and these exceedances were only seen in boring 681SB001.

Comment 17:

Section 10.6.6.1. Please note that an USEPA report by Technical Review Workgroup for Lead (December 1996) provides recommendations for an interim approach to assessing risk associated with adult exposure to lead in soil. Under the light of above fact please reconsider the statement "...USEPA does not currently sanction any risk characterization model or approach for predicting the adverse health effects of lead in adults".

Response 17:

Please note that the HHRA which was found in Section 10.6.6 of the draft report is in Section 10.6.8 of the report addendum. The *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil* is used to evaluate lead exposure for AOC 681. In addition, the above referenced statement has been deleted from the text.

Comment 18:

Section 10.6.6.2. Under the 'COPC identification' Section TPH is not mentioned as a COPC whereas Table 10.6.10 identifies TPH as a COPC. TPH has not been discussed under exposure assessment and toxicity assessment. A qualitative risk discussion on TPH is required if TPH is recognized as a COPC.

Response 18:

Please note that Section 10.6.6.2 is now 10.6.8.2 in the report addendum and Table 10.6.10 has been relabeled as 10.6.13. The revised Table does not identify TPH as a COPC. Typically the focus of the investigation is on RCRA regulated constituents. Where TPH has been detected, it is compared to standards provided under the State of South Carolina's UST Program. Sites where TPH concentrations are above UST standards are transferred to the Navy's Petroleum Storage Tank Program (as applicable). To date, quantitative risk assessments involving TPH exposure have not been necessary.

SPECIFIC COMMENTS

S/A Number	Site Name	Notes
681	Blast Booth & Cyclone	a) Soils: PAH, TPH (no 2 nd interval samples taken) b) Lead 2 nd interval > background c) Was an OWS a part of this site? d) No wells at this AOC

Response:

Comment "a", Multiple SVOCs were detected in soil samples (both surface and subsurface). Additional soil and groundwater samples have been collect by both EnSafe and the Detachment and the results of the additional analysis is included in the AOC 681 report addendum (Section 10.6.2 of the RFI report). TPH analyses were not performed on subsurface samples and the reason for this is not known. The point is mute however since TPH is not a RCRA regulated substance. As noted above, additional samples have been collected and analyzed for specific, regulated substances.

Comment "b", Lead was detected in the second interval above background in two samples but the detections were well below the residential action level of 400 mg/kg.

Comment "c", A 1968 sewer map indicates an oil water separator with a UST was located just off the northeast corner of Building 681, between 681 and Building NS-27. Based on a 1981 demolition map, this o/w separator and UST was closed by removal. Copies of these drawings are included as an attachment to the addendum report. There was an o/w separator and UST located on the east side of Building 681 which was closed by removal in 1997. A UST Assessment Report was complete and submitted for this removal. Also, field personnel encountered a line during soil sampling between buildings 680 and 681 that may have been associated with another oil water separator. A number of additional soil samples were collected in this area between the buildings. No additional information was discovered to indicate the nature or history of any o/w separator located between the two buildings.

Comment "d", Three groundwater monitoring wells were installed at AOC 681 in 1998 and three rounds of samples were collected from these wells. The results of the sampling are presented in Section 10.6.4 of the RFI report addendum. Grid well pair 13 is down gradient of Building 681 and is downgradient of the reported o/w separator. Per the 20 January 1998 conference call, 3 DPT samples were collected in a triangular pattern around grid well GDI013/13D. This data is also included in Section 10.6.4 of the RFI report addendum.